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VOLUME XLIV

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The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first were *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July, and August. Its scope is the publication of the results of original research in all departments of Natural History.

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DISCOVERY OF THE BREEDING GROUNDS OF THE BLUE GOOSE

By J. DEWEY SOPER

Foreword

THE Blue Goose is one of the most interesting of the migratory birds of the North American continent. It winters in the United States near the mouth of the Mississippi river, but the whereabouts of the summer breeding grounds has, until recently, been a mystery.

Ornithologists of Canada and the United States have long held various opinions as to the probable location of these grounds. Such conjectures were confined to the northern regions of Canada. By a gradual process of elimination the breeding grounds were finally limited to an area within the Eastern Arctic, or more particularly to Baffin Island and the adjoining mainland of northern Quebec, and there followed a long search for the exact location.

As the administration of the resources of the Canadian Arctic Archipelago is a function of the North West Territories and Yukon Branch, of the Department of the Interior, it was natural that this branch should be interested in solving the mystery surrounding the location of the nesting area of the Blue Goose. The National Parks Branch of this Department, which administers the Migratory Birds Act, also cooperated in the organization of the expedition, which attained success in the summer of 1929. For the purposes of this work the services of Mr. J. D. Soper were obtained in 1928. He had previously been connected with the National Museum of Canada, being engaged in research work for that institution in the eastern Canadian Arctic, chiefly Baffin Island, from 1923 until 1926. His wide experience of Arctic travel, combined with his training as a naturalist, accounted largely for the success of the undertaking.

The following paper tells briefly the story of his search and the discovery of the Blue Goose grounds on Baffin Island.

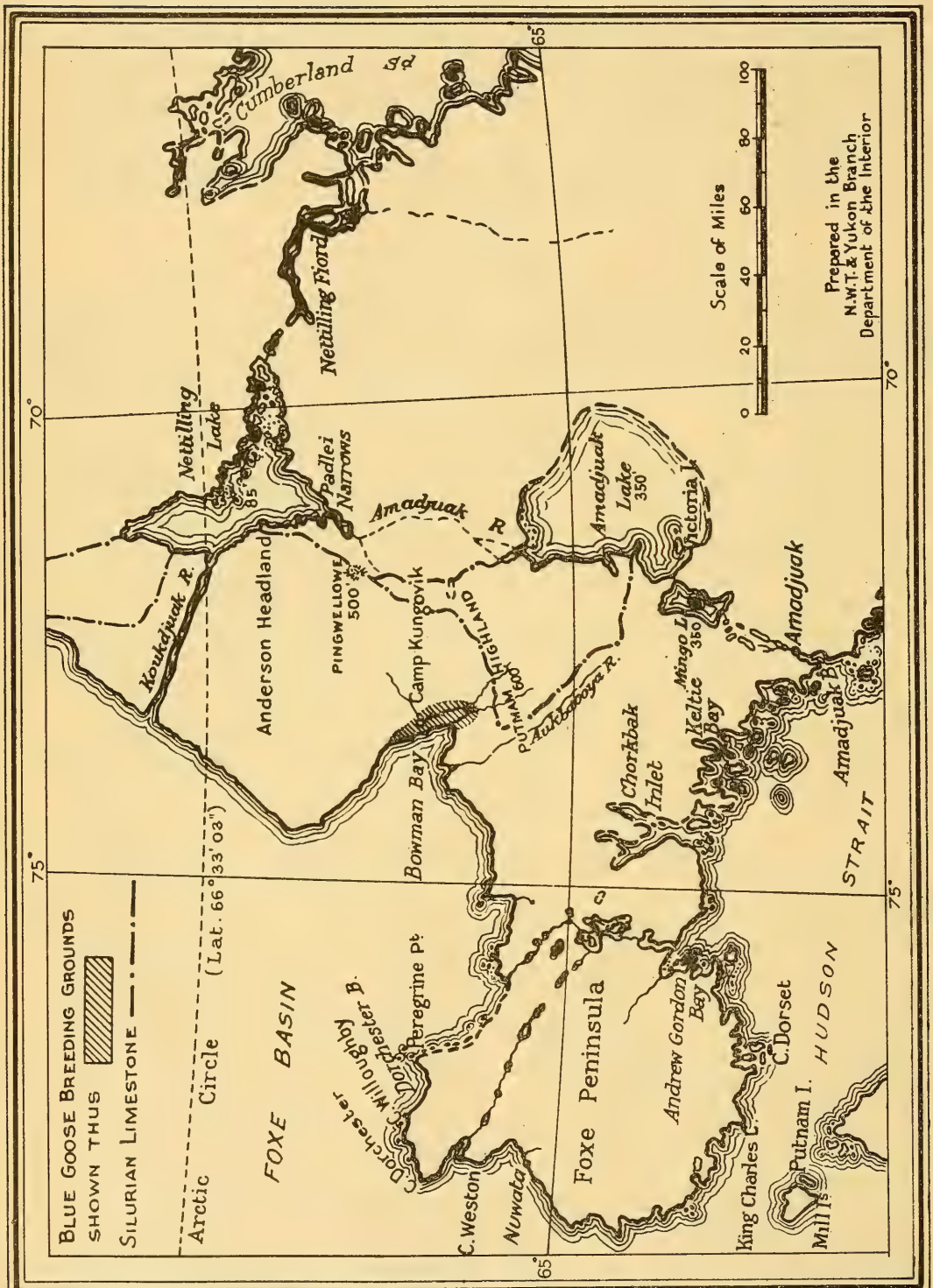
W. W. CORY,
Commissioner, N.W.T.

November 23, 1929.

TO write a full account of the long search for the breeding grounds of the Blue Goose (*Chen caerulescens*) would be to engage in a task demanding a lengthy volume in itself. Sufficient for the present purpose, however, is a brief story telling of these things—the major events and incidents instrumental to success, and the final discovery of the nesting grounds in the summer of 1929. While popular in spirit and conception, it makes no effort toward a scientific presentation of ascertained facts. In a later publication will be brought together, in detail, all that is known of the general habits and activities of the Blue Goose while on its breeding grounds.

Any object savouring of the unknown especially stimulates speculation and curiosity. The mystery, therefore, which previously surrounded the Blue Goose nesting grounds was well calculated to arouse the interest of biologists in general, and particularly those having opportunity for travel in the regions of the Canadian Arctic Archipelago and the mainland immediately to the south. Where in this vast area it nested was unknown. To hazard a guess, as was done in articles on distribution, brought the truth no nearer. Decades and generations passed—even centuries since the first coming of the white man, yet the eternal solitude of the Arctic still claimed its secret.

Passing over the temperate and lower boreal zones during migration, the Blue Goose was lost to us completely in the vast Arctic wilderness beyond. Where did it go, and whence did it come? Region after region, as a probable nesting area, was gradually removed by a process of elimination. Based, finally, on certain aspects of the Blue Goose migration, it was generally assumed that the species nested somewhere in the eastern part of the Canadian Arctic Arch-



Sketch map of the southwestern portion of Baffin Island, showing the location of the breeding grounds of the Blue Goose.

ipelago, or in the Arctic, or sub-Arctic portion of northern Quebec. Yet perplexities remained. The prodigious expanse of country involved, its comparative inaccessibility, Arctic character, and the difficulty of travel, all militated against early success in any undertaking of discovery.

But Man is ever restless and inquisitive. My own opportunity came first in 1923 when I went as naturalist of the Canadian Arctic Expedition for the National Museum of Canada, visiting Greenland, Ellesmere, North Devon and Baffin Island. I resolved then to devote myself to the discovery of the Blue Goose nesting grounds insofar as I was empowered to do so. During the course of that voyage of some 7,000 miles information was sought everywhere as to the possible occurrence and movements of the Blue Goose, and Lesser Snow Goose, which habitually associate during migration. At one place only was any information obtained. This, on the authority of the Cumberland Sound Eskimos, pointed to the probable nesting of the Blue Goose on the southern shores of the Nettilling Lake, in the Baffin Island interior.

With this intelligence I returned to Baffin island for the National Museum of Canada in the early summer of 1924, prepared to remain one or two years. The southern shore of Nettilling lake was the ultimate objective. The entire summer and fall were spent about Cumberland Sound without adding anything to our knowledge of the northern geese. Likewise, during the winter of 1924-25, after travelling some fourteen hundred miles by sledge and visiting numerous Eskimo tribes, nothing was learned in addition to the information gathered about the Blue Goose from the Cumberland natives in the fall of 1923.

The following spring, with a party of Eskimos, the long-planned journey of investigation was made to the interior of the island. This had for its major object, of course, the discovery of the breeding grounds of the Blue Goose. After a strenuous season and many hardships covering a period of five months, from mid-April to late September, the party returned to headquarters at Pangnirtung in Cumberland Sound. Though, during this time a large extent of country was explored about Nettilling lake and the Koukdjuak river, nothing was ascertained relating to the nesting area of the species.

While, as regards this particular feature, the long period in the interior ended in failure, it cannot be maintained that the original statements made by the Eskimos were necessarily erroneous. The physical character of the country along the southern shore of Nettilling lake is favourable to the nesting of the Blue Goose and at one time it probably bred there, though, in recent years at least, it has ceased to resort to that region. In fairness to the natives, it should be stated that they no longer visit lake Nettilling on the annual caribou hunt in such numbers, or so regularly as they did, say, thirty or forty years ago. Recent summers have been known to pass without Eskimos going to the lake region at all. It is, therefore, conceivable that conditions have changed there without the common knowledge of the Cumberland tribes.

This one interesting feature, however, was disclosed: Large numbers of Snow Geese were seen migrating across the Koukdjuak river in late August and early September, and old Eskimo stone corrals were observed along the river which pointed to the fact that the natives had formerly trapped geese here in considerable numbers during the moult. This, admittedly, had no direct bearing on the main object, except for the highly circumstantial evidence that here obtained an extensive breeding area for geese. Having found, therefore, a place of common resort for geese on the great swamp plains of the west, it was natural to infer that somewhere in this region would also be found the Blue Goose, possibly farther south on the Foxe Basin coast, or in the Foxe peninsula.

The winter of 1925-26 was again devoted to long journeys of exploration by dog team, principally in the interior of Baffin Island. Various trips, aggregating more than a thousand miles, took me over unexplored routes through the rugged terrain beyond the head of Cumberland Sound, on the north shore of Nettilling Lake beyond the Arctic Circle, and even to the western coast of Baffin Island on Foxe Basin. This constituted the first successful crossing of the island by a white man to return again in safety. Bernhard Hantzsch, the German ornithologist, was the first to reach the Foxe Basin coast overland from the east, but unfortunately he perished there near the mouth of the river which now bears his name in latitude 67° 33′ north. Not until after my return from this expedition on Baffin Island were his journals translated from the original German, in which it was disclosed that Hantzsch knew nothing of the breeding grounds of the Blue Goose. In 1925 I should have regarded this information as having considerable value, with the result of directing my efforts to other quarters. During the winter journeys above referred to, Eskimo tribes were questioned along the coasts, as well as nomads in the interior, without bringing any additional light to bear upon the problem of the Blue Goose. After a personal residence of nearly

Typical nesting area of the Blue Goose, Eshuleeungnil Plain, Bowman Bay, Foxe Basin. Lat. 65° 30′ N.

July 4th, 1929.

two years in the country, the species remained almost as great a mystery as before.

Mindful of the things seen and the inference drawn on the Koukdjuak plains in the fall of 1925, it was decided in the spring of 1926 to journey from Pangnirtung, in Cumberland Sound to Cape Dorset at the southwestern extremity of Baffin island—a distance of about five hundred miles by dog team. What would be learned there? Study of the map suggested Cape Dorset as a strategic point at which to witness the migration of the Blue Goose from the south, to the western fastness of Baffin island, if they went there as surmised. Moreover, there was the distinct advantage of coming into contact with additional tribes of Eskimos, who possibly possessed some definite knowledge of the summer home of the Blue Goose. With each change of location and every venture recurred the old thought—is this to establish a turning point in the long-protracted search?

Arrival at Cape Dorset, by sledge, on May 21, 1926, was sufficiently early to permit the observation of any goose migration which might occur there. This hypothesis of migration proved to be well founded, for early in June large numbers of Blue Geese were seen passing over Cape Dorset in company with the Lesser Snow Goose. These were flying high in a northeasterly direction as though bound for some relatively distant locality. From the Eskimo it was learned later that considerable numbers also migrated northward over Foxe Land via Andrew Gordon bay and Chorkbak inlet. These facts seemed to indicate, therefore, that the Blue Goose nested at some point on western Baffin island. This, at least, was a definite step forward.

In late July of the same summer I collected two Blue Geese, associating with several Lesser Snow Geese, nine miles northwest of Cape Dorset. This seemed to indicate, further, a comparative proximity to the actual nesting area. In any event it furnished tangible evidence of a kind and constituted the first specimens of the Blue Goose taken in the moult on Baffin island.

Immediately following this occurrence I had the good fortune at Cape Dorset to meet two Gordon Bay Eskimos who, some years before, had hunted caribou over the great tundras of northern Foxe Land and along the west coast of Baffin island to within about one degree of the Arctic Circle. These men possessed a good

fundamental knowledge of the Foxe Land interior and, moreover, a local reputation among their own people for having stumbled upon the breeding grounds of the Blue Goose. These men were thoroughly questioned, and encouraged to impart all the information they possessed respecting the Blue Goose on its summer range. The earnestness and candor of their account and the perfect agreement of their separate statements were entirely convincing. There appeared but one possible conclusion—that the chief breeding grounds of the Blue Goose had been definitely indicated at last, after nearly three years of close search and about 4,000 miles of personal travel by dog team and small boat in and about Baffin island. Routes were discussed with the Gordon Bay Eskimos for reaching the grounds and even a rough map was prepared indicating the area in which the species was reputed to nest.

In the meanwhile other Canadian Government officials, including the Royal Canadian Mounted Police, had executed long journeys and patrols over the country. They, also, were interested, but unfortunately no definite information was secured regarding the Blue Goose. The question had now become one of general interest in which the Hudson's Bay Company men participated, and through their interpreters interested practically all the Eskimo tribes of Baffin island.

With the encouraging information gathered at Cape Dorset, I returned to civilization in the fall of 1926. It was my expressed belief that, were an energetic attempt made to reach the territory indicated by the Eskimos in early spring, success would be practically assured. This called for another year in the Arctic, for by the time the annual ship reaches these northern latitudes the season is too late for such an investigation. The region must be reached by sledge the following spring in advance of the geese migration.

In the summer of 1928 I was sent back into the Arctic, once more to follow the illusive Blue Goose, which may be said to have led me from Pangnirtung in 1923 over many hundreds of weary miles of exploration. This time the enterprise was organized and carried out under the direction of the North West Territories and Yukon Branch, although the National Parks of Canada, also of the Department of the Interior, took a direct interest in the expedition.

I landed at Cape Dorset once more on the 5th of August, 1928, where headquarters was es-

Pack ice on the Foxe Basin coast, near the mouth of the Kommanik River. Aug. 11th, 1929.

tablished for the year. Nearly the whole winter was spent in traversing and mapping Foxe Land and the west coast of Baffin island north to 67° 40′, near which point the courageous Hantzsch perished in the interests of ornithology. This resulted in a considerable familiarity with the great Foxe Land interior and the Foxe basin coast, and twice took me over the very region in which the Blue Goose was said to nest. In consequence, when spring arrived, I was possessed of a minute knowledge of the territory and the best route by which to reach my proposed headquarters for the summer.

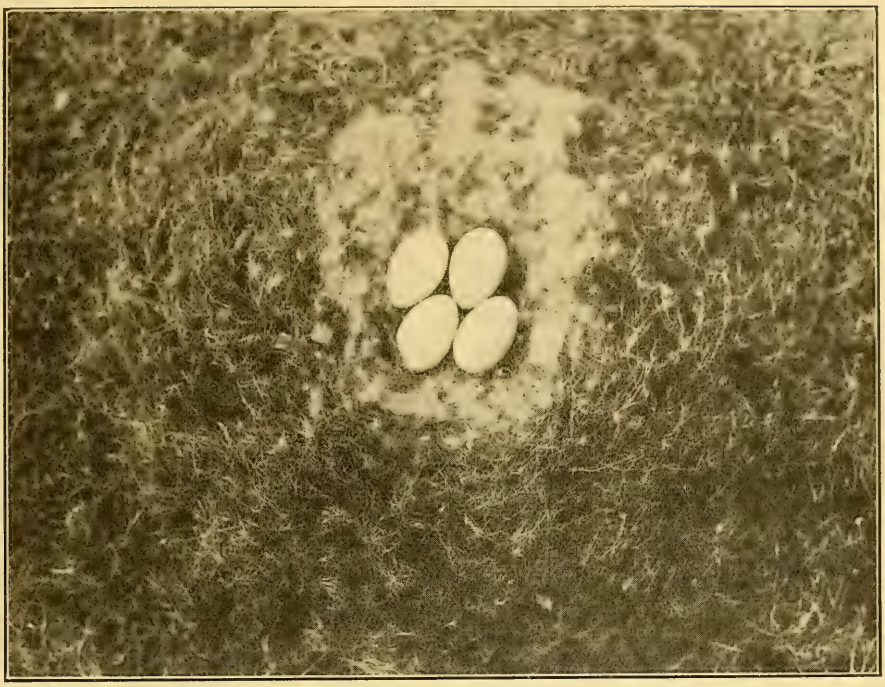
On May 17 I left Cape Dorset for the Blue Goose grounds with four sledges, forty-two dogs and five Eskimo drivers, carrying sufficient food and equipment to cover a period of three months in the interior. We travelled along the Hudson strait coast to Chorkbak inlet, followed that to its northwestern extremity in Terreooya bay, and thence directly across Foxe Land to a point on the west coast of Baffin island north of Bowman bay. After eight days of unremitting and hard travel we reached the proposed site of our summer camp on the banks of a tundra river near Foxe basin in latitude 65° 35′ North. This was named Camp Kungovik after the Eskimo name for the Blue Goose.

On the 25th of May three Eskimos with all the dogs and sledges started on the long back trail to Cape Dorset. Two Eskimos were retained as assistants for the summer—Kavivow of Cape Dorset and Ashoona of Gordon bay. We were now left entirely alone with the nearest natives several hundred miles distant and in this situation we placed our entire reliance for our safe retreat from the region in a freighter-canoe with which to navigate Foxe basin and to travel by rivers and lakes across Foxe Land to Hudson strait the following August.

Now that we were located well within the designated breeding area of the Blue Goose, we had but to be patient, make ourselves as comfortable as possible, await the retreat of winter and the arrival of the birds. Though the season was extremely backward with freezing weather, blizzards and fresh falls of snow in late May and early June, we had not long to wait. The first geese of the season passed over Camp Kungovik on the evening of June 2. The prospect was undoubtedly discouraging, for winter conditions, practically, still prevailed except for considerably higher average temperature.

The next geese were noted on June 5. Some of these, like those of the earlier flock, were Blue Geese. In the evening a flock of 34 geese alighted

Loading canoe for departure from Camp Kungovik, on the Kungovik River. Lat. 65° 35′ N. July 20th, 1929.



Nest of the Blue Goose, Eshuleeungnil Plain, Bowman Bay, Foxe Basin. July 4th, 1929.

to feed on a narrow strip of snow-free tundra bordering the Kungovik river. Twenty-four of the birds were Blue Geese and the remainder, presumably, Lesser Snow Geese. June 6 marked the beginning of the real migration of geese to the region. Large numbers of birds passed over camp to the north and northwest during the day, the two species—Blue and Snow—always in company. The former constituted approximately one-third of the total number observed. The numbers of geese were very considerably increased on June 7 when the Blue species was almost as numerous as the Snow.

By June 8 and 9 thousands of geese were resorting to the bare patches of tundra in the region. As these areas were small and localized, they brought the geese together in large flocks to feed on the scanty vegetation. By a singular piece of good fortune the most extended of these snow-free areas lay along the banks of the Kungovik river, from a point opposite camp for about one and a half miles downstream. This was no more than a marshy strip 10 to 15 feet in width, but geese in very large numbers resorted to it for food and rest. With the powerful glass of the transit theodolite, which was mounted on a slight elevation near camp, unexcelled opportunities for observation were enjoyed daily when the weather permitted. Such gatherings were invariably noisy and the voices of the geese which cover a wide range of expression were to be heard at all hours of the day and night.

On June 10 a single fresh egg of either this species, or the Lesser Snow Goose, was found on a bare patch of ground in the uplands of the Asweeto ridge. Obviously this was abortive, as the species was not yet beginning to nest. Subsequently, many such eggs (almost invariably punctured and the contents eaten by the Parasitic Jaeger) were discovered, over the feeding grounds resorted to by flocks of geese.

The heaviest migrational wave of geese occurred over the 14th and 15th of June. This was most pronounced on the former date when, strangely enough, the birds travelled directly in the face of one of the severest northwest gales of the season, which appeared to tax their energy and tactics to the utmost. They flew low, sweeping in and out of valleys to take advantage of every hill that afforded any protection from the wind. Associating with the mixed companies of Blue Geese and Snow Geese were large numbers of Hutchin's Geese and Brant migrating in the same direction.

No pronounced great "wave" occurred after the 15th of June. This terminated the furious

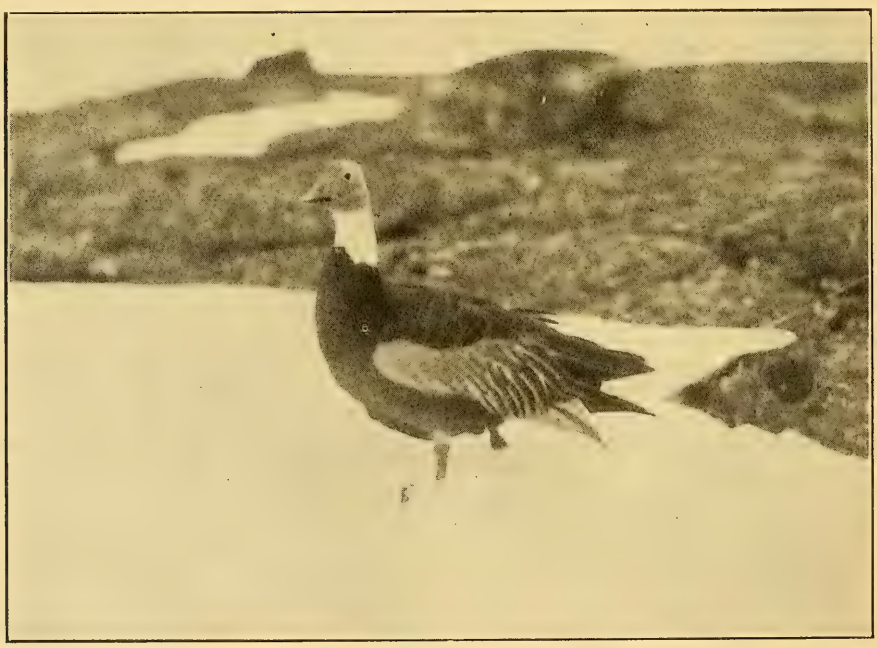
northern urge. Yet flocks went over from time to time, flying low as well as at altitudes of a thousand feet or more. Undoubtedly these were bound for more northern latitudes, but the greatly diversified direction of flight proved that the great majority were now local birds, or had leisure, for one reason or another, before passing on to other localities.

Up to June 24 geese consorted in large numbers over the surrounding lowlands, which, by this date, were being rapidly cleared of snow. Particularly desirable haunts, also, were grassy valleys about swelling ponds in the low granite hills of the Asweeto ridge. Any walk of a few miles revealed hundreds of geese feeding in these sheltered places. After the above date there was a pronounced decrease in numbers of local geese, which up to this time had exhibited no definite tendencies to disband.

The breeding birds were now withdrawing quietly to the nesting areas, leaving large numbers of non-breeding geese to fly aimlessly about in carefree existence during the brief span of the Arctic summer. With the passing of the migration, Blue Geese were left in a considerable majority in the region surrounding Camp Kungovik. Lesser Snow Geese, which continued to associate with the Blue, occurred as one to six or eight of the former, while Brant and Hutchin's Goose became scarce. This was distinctly the "Land of the Blue Goose."

For about ten days we searched the region on foot for nests without success. The outlook was decidedly discouraging, as late June approached, for much of the success of the venture depended upon the actual discovery of nests and eggs. Blue Geese were nearly everywhere, but in such a vast expanse of territory, it is difficult to locate the nests of a species which is colonial in habit, and without the tendency, apparently, to nest with individual freedom over the country. Finally, however, on the 26th of June a small colony of breeding geese with ten nests was discovered on the tundra near Foxe basin in latitude 65° 30′ N. Eight of these were nests of the Blue Goose and two of the Lesser Snow Goose. Sets were incomplete with only one or two eggs—one nest alone contained three.

This season it was disappointing to find that no Blue Geese nested in the immediate vicinity of Camp Kungovik. Judging from the numbers and actions of the Blue Geese, it was certain, however, that the nesting localities were at no great distance. Several years before Kavivow had tramped through this region on a caribou hunt well beyond the Asweetuk ridge and had noted but two places where the species nested in numbers. One was eight miles southwest of



Blue Goose, taken near Bowman Bay, Foxe Basin. Bird slightly wounded. June 6th, 1929

Camp Kungovik and the other, where the geese nested in vastly greater numbers, was at a point ten miles to the northwest on the tundra just beyond the western extremity of the Asweetuk ridge. Here the nests were said to be in such numbers that great care was required, in walking through the locality, to prevent treading upon the eggs. Both Blue and Lesser Snow Geese were represented, but the former were very considerably in the majority.

On the 1st of July we were able to descend the Kungovik river by canoe to within a few miles of this colony. Provisions and equipment were taken for a week's stay in the locality to make as thorough a study as possible of the nesting habits of the species. The colony mentioned above was relocated, in addition to which many other nests were discovered with sets varying from one to four in number. The eggs at this time, without exception, were considerably incubated.

Blue Geese here greatly predominated, and collectively, numbered several thousand. The overwhelming preponderance of the species on its breeding grounds, together with the fact that in no case were Blue and Snow Geese seen mated with each other, leads one to the belief that the former exists as a distinct species, regardless of the most obvious and close association of the two species in a natural state. That they may occasionally hybridize is not impossible or improbable. Certain facts are at hand to indicate that the Lesser Snow Goose is greatly in the majority farther north—in fact, gathers at the Koukdjuak river in the fall of the year to the entire exclusion of the Blue Goose. This at least was the case while I was exploring on the Koukdjuak river during the late August and early September of 1925. The ranges of the two, therefore, appear broadly to be separated regardless of their local association. Figures for the Eshuleeungnil plains, where the Blue Goose nests, place the ratio of Blue to Snow Geese at twenty-one to one. The most impressive condition, aside from this, is the astonishing abundance of birds congregated over this area in relation to the number found breeding.

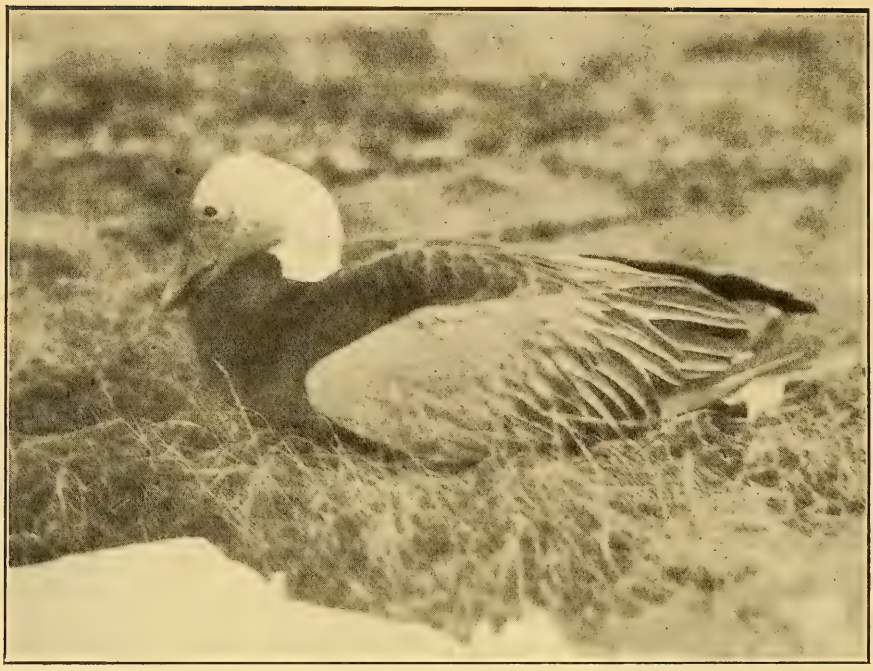
The nest is always located on a slight grassy swell of the plain, which places the area a few inches above the general surroundings of more sodden ground, marshy depressions, and numerous shallow ponds. Here the ground is comparatively firm and well grown to moss and grass. Most of the nests are constructed of finely plucked and shredded tundra moss, lined with a mixture of fine dead grasses and light-coloured down. Others are built entirely of grass and a kind of chickweed, the inside depression, as a receptacle for the eggs, being similar in all cases. A combination of the two is also to be observed. All the nests are bulky in relation to the inside diameter, though the size varies considerably. Those of grass and chickweed were notably smaller than those of moss. This is evidently for the reason that the grass knits together more firmly than the fragmentary moss and, therefore, requires less bulk to withstand the frequent high winds which sweep over this region. Eggs are pure white until soiled in the nest; sets vary in number from one to four.

By July 10, large mixed flocks of Blue and Snow Geese in the moult were observed on the Kungovik river and adjacent tundra. Some of these flocks contained as many as 300 to 500 individuals constituting one of the most remarkable spectacles of the season. Approximately seven-eighths of the total number observed were Blue Geese. These large moulting flocks are unquestionably composed of non-breeding birds, possibly first-year individuals, and comprised of both sexes. The reproductive organs were passive in a series of ten specimens which were taken for examination.

Upon quitting Camp Kungovik and descending the river toward the sea on July 20, the first juvenile Blue Geese of the season were met with. These were only two or three days old; many broods were observed numbering variously from two to five individuals. In the course of the next three days while travelling on the river, or encamped beside it, several score of young Blue Geese were noted, in addition to a number of broods of the Lesser Snow Goose.

The downy young of the two species are distinguishable almost as far as they can be seen. Those of the Blue are a dusky, greenish-grey, quite dark over the back and head, with a pale lemon patch on the upper throat. The bill is blackish, except for the tip which is bone colour. *The feet and legs are jet black.* A clear lemon-yellow distinguishes the young of the Lesser Snow, which is most vivid on the front and sides of the head and on the throat; the upper parts have a pronounced dusky cast. The bill is very similar to that of the Blue Goose, but easily distinguishable from it in fresh specimens. *The feet and legs are dusky "Vetiver Green" with a hint of pale violet on the inside of the legs and on the webs of the feet.*

In every instance the parents of the juveniles secured were both of the same species. This also applied to all other pairs observed with young. The families, however, frequently mingled on the tundra irrespective of species. Moreover, all these parent birds were still capable of flight,



Blue Goose (Chen cærulescens) on the Eshleeungnil Plain. June 1929.

while hundreds of the non-breeding individuals had lost this power in the moult some time before.

An unsuccessful attempt was made to bring four downy young of the Blue Goose out of the country alive for purposes of study. Despite every effort that was made to provide them with food such as they would get under natural conditions and to keep them warm inside our clothing and sleeping bags during the cold part of the night, all died within a few hours of each other on the third day after capture. By this time we had secured a nest and a large collection of adult specimens, sets of eggs and downy young as material to assist in the scientific study of this beautiful bird upon its breeding range—a species which has long baffled the ornithological world in respect to this phase of its life history.

On the 24th of July we reached the mouth of the Kungovik river and passed out to sea among the milling floes of Foxe basin on the long homeward voyage. The Blue Goose plains faded away behind us on the horizon, the long quest was ended, leaving us concerned only with our safe arrival at Cape Dorset together with our precious cargo of scientific material.

Had ice conditions been favourable in Foxe basin, ten days of steady travel would have been sufficient for the return trip along the south coast of the basin and across the Foxe Land interior to Hudson strait. Food was taken for eighteen days to cover emergencies. The massive ice and the furious currents of this ill-reputed sea, however, almost caused our downfall. As far as eye could detect the broken ice fields extended seaward without a break and pressed upon the coast in great, rugged masses of utter confusion. The only possible means of progress with the canoe was to advance a few miles on the two high tides daily when a narrow water lane occurred between the grounded icepack and the low shore. Hope of reaching Hudson strait in time to catch the annual ship was several times abandoned, but a stubborn fight was maintained, nevertheless, over the 70 miles of ice-ridden coast to the mouth of the Kommanik river. This stream was ascended with further difficulties, and many portages, to a chain of lakes which provided a continuation of the previously unexplored route across the interior of Foxe Land to Andrew Gordon bay. After a long struggle of 28 days, and with our food entirely exhausted, Cape Dorset was finally reached on the 17th of August.

A small schooner was immediately chartered from the Hudson's Bay Company, with an Eskimo crew, and the 360-mile voyage begun to Lake Harbour on the south coast of Baffin Island, to make connections with the annual Canadian

Government steamer *Beothic*. Strong easterly gales and heavy seas were contended with throughout the run down Hudson Strait, but the final satisfaction befell us of reaching Lake Harbour as darkness was falling on the 24th of August, just nine hours before the scheduled arrival of the *Boethic*. A week later we were safely back in civilization. By varied means of progression directly and indirectly concerned with the work in hand since 1923, I had travelled a total, approximate, distance of 30,300 miles. Thus ended the long line of adventures in the quest of the Blue Goose.

CAMERA LUCIDA WORK

By F. I. FRASER

THERE are many occasions when a pictorial record of a microscope object is highly desirable. Photomicrography is a specialized art, expensive and time consuming, and for really good results, unless one is an adept, professional work is essential; even so, unless one can be present when the actual exposure is made, it is difficult to ensure that the photograph actually brings out the required points. With perfectly flat objects, this difficulty is not so great; it is, however, with objects that are not flat that the present note is chiefly concerned. What the microscopist invariably desires, is to bring out particular details, in illustration of which the perfection of the finished photograph, as such, is an entirely subordinate matter. From this point of view, the writer has attempted reproduction by freeband sketching, but, lacking talent, the results were only a partial success. The objects concerned were sand grains, not the usual quartz grains, but those heavier minerals which remain as a concentrate after panning. These "heavy residues", as they are technically called, may be obtained from nearly all sands and during the last fifteen years or so have been receiving increased attention from microscopists interested in mineralogy and petrology. For the reproduction of such objects, a camera lucida was tried, and after a little practice, the results were deemed sufficiently good for publication.* The writer having derived much previous help from others, (what microscopist was ever without that pleasant experience?) is tempted to offer this note in the hope that it may benefit others and stimulate interest in camera lucida work. Most workers will agree that a simple diagram is worth pages of description.

The sand grains under consideration range from 0.05 mm. to 0.3 mm. in length, with thicknesses from 0.05 mm. to 0.1 mm. In an object of such thickness, it is impossible to obtain a really good photograph of anything but a small portion of the grain, that is, if any detail is to be shown. When surface markings are seen, the edges are fuzzy; when one edge is sharply focussed, the remainder is blurred. With a camera lucida, these points can be reduced from chaos to order, in that the sand grain can be shown as though all the essential details could be seen at once. Another point that can be beautifully brought out is the relative refractive index of the mineral; this is important in petrological work. Quartz has a refractive index close to that of Canada balsam—about 1.55; that of heavy minerals found in sand commonly vary from 1.64 (apatite) to over 2.6 (rutile). Grains of such high refractive index stand out in high relief, and show black borders. This can be shown if necessary, very nicely in a camera lucida drawing. Under a low power, a mineral with a high refractive index shows very thick black borders with normal illumination, but under a high power showing greater detail and with different sub-stage lighting, these heavy black borders tend to disappear; the finished drawing should therefore carry with it details under which the drawing has been made. Obviously a reproduction of a grain under a low power enlarged to the same proportions as a reproduction under a high power will be quite different if the object contains any amount of detail. For this reason, some measurement of the original object is much more satisfactory than giving a figure of so many "diameters" or so much "magnification". Then again, the crystal faces and edges can be so well shown. This cannot be accomplished by a single photograph, and often the crystal form is very perfect in heavy mineral grains.

Regarding the actual use of the camera lucida, with no wide experience of the various types on the market, the writer can only express an opinion on the ocular (split prism) type which he constantly uses and has found very satisfactory. On setting up the instrument, the prism may require a little adjustment, and this is best effected by suitable manipulation with a wood splinter about the size of a match; this will not injure the straight edge of the prism. The tube of the microscope is inclined at about 45 degrees, so

* *See*: Some Heavy Detrital Minerals in Canadian Sediments, Can. Field-Nat. 43: 117, September, 1929.

that the plane of the emergent face of the prism is parallel to the plane of the paper on which the image is traced; in this case, these planes are horizontal, and the drawing paper is placed on the table and below the camera lucida. With the writer's instrument, using a one-sixth inch objective, 0.1 mm. on a stage micrometer measures 42 mm. on the drawing paper; when the tube length is increased by 24 mm., the image is 50 mm. After the main outlines have been traced over, the camera lucida ocular is removed and replaced by a low ocular, and the details sketched in. The drawing may be improved by the addition of brush work for delicate shading. It must be remembered that zinc cuts reproduce line work only; brush shading can only be reproduced in a half tone block—which is more expensive.

The primary secret of successfully setting up the camera lucida is to cut down the light on the field, and illuminate the drawing paper strongly with oblique lighting; avoid direct lighting of the paper as it produces glare. For some reason or other, workers to whom the usuage of this accessory is new invariably attempt the reverse of these lighting conditions; this is rapidly followed by a perfectly unjustified complaint that they are unable to obtain results. In addition, trial attempts at tracing with pencil and India ink respectively, show that pencil work is a failure until the worker has become thoroughly acquainted with the lighting effects; therefore use India ink at first, it shows up well. To test lighting effects, the finger placed immediately under the camera lucida to cut off the drawing image shows if the lighting of the stage is too strong. The hand placed in front of the substage mirror shows if the illumination of the paper is too weak.

GLIMPSES OF LITTLE-KNOWN WESTERN LAKES AND THEIR BIRD LIFE

By J. A. MUNRO

(Continued from page 205, Vol. XLIII)

FARREL LAKE, ALBERTA

THIS is a long, narrow lake—approximately seven miles long and a mile wide at the widest point—lying north west by south east. The water is fairly deep and contains less alkaline salts than is usual in the lakes of this district, but sufficient to prevent the growth of aquatic vegetation. The shores are chiefly of hard yellowish sand and shingle with occasional stretches of hard mud, usually with a deposit of sand on the surface. Above the beach, or at high water, a scant growth of wiry sedges is general—there is no rush growth. The surroundings consist of fairly level prairie, much of which is under cultivation. Along the shore are occasional willow bluffs and patches of wolf-willow and rose bushes.

During August, 1923, water fowl were not abundant; a few single Western Willet, Killdeer, Shoveller and Mallard were seen, also a brood of downy Baldpate and a brood of young Canada Geese. The latter were raised on one of the islands near the east end of the lake—so I was informed. Several residents who were interviewed gave good accounts of the goose and duck shooting that may be had along the lake during the month of October and stated that geese were often shot from the shore as they passed to and from their feeding grounds.

GOOSEBERRY LAKE, ALBERTA

Gooseberry Lake was reached on August 12th, 1923, by an exceedingly rough trail running east from Sounding Lake. It can best be approached by the trail north from Consort which reaches the east end of the lake.

The water, which appeared to be at its normal level, was moderately deep and of a clear blue but impregnated with soda. The shores are of yellow sand and gravel supporting no rush growth, nor are there any aquatic plants in the lake. The surroundings are attractive rolling prairie, dotted with bluffs on the south and west, becoming more broken on the east and rising to a height of approximately two hundred feet on the north—a moderately steep grassy hill with many depressions and winding coulees grown up thickly with brush. Along the base of this hill is a continuous belt of willow and poplar which extends along the east shore also. Everywhere there is a gradual slope from the water's edge—there are no cut banks.

The N.E. ¼ of Section 22, 36, 6, W4, is all rough, hilly land surrounding a circular bay which is connected with the main lake by a narrow creek spanned by a wooden bridge. The only birds noted on the lake were seen on this bay. These were Lesser Yellowlegs, Killdeer, a mixed flock of Bonaparte's and Franklin's Gulls, and several broods of Pintail.

It is said that geese and ducks will not stay on the lake for any length of time owing to the character of the water.

HANDHILLS LAKE, ALBERTA

Handhills Lake is surrounded by open, rolling

prairie, partly under cultivation for some distance back from its shores. Except for a few scattered willow bushes near the south end, there is no cover and the littoral is bare, sandy and unattractive. The shores are of hard sand and gravel, the water is impregnated with soda and no aquatic vegetation is found in the lake. On August 16th, 1923, a few diving ducks, an Eared Grebe, several Franklin's Gulls, and a large Gull in immature plumage were the only aquatic birds noted.

DOWLING LAKE, ALBERTA

This is one of the characteristic "soda lakes" of the district without aquatic growth in the water or along its shores and surrounded by open grassy prairie of which only a relatively small portion is good agricultural land. In August, 1923, the water level was lower than it had been for some years and practically the entire lake was surrounded by a wide expanse of mud and sand flat. In some places the old lake margin is defined by a gravel bank, the base of which is now grown up with wolf-willow and other low shrubs.

Except for minor topographical differences the balance of the lands adjoining the lake are similar, viz.; grassy hillside or flat with a wide margin of muddy shore.

There is a long narrow island in the N.W. ¼ of Section 7, 32, 14, W4, with a thick growth of wolf-willow and poplar—comprising the heaviest growth of brush near the lake. I was informed that ducks, geese and crows nested on this island.

It is said that large numbers of Canada Geese, Snow Geese and ducks visit this lake in the autumn.

LITTLE BOW RESERVOIR, ALBERTA

On July 16th, 1922, we visited the Little Bow Reservoir in Township 14, 20, W4. This artificial lake, created to hold a reserve of irrigation water, in many respects resembles Lake Newell lying some forty miles north east, which elsewhere has been described*. The surface area of the Little Bow Reservoir is smaller—approximately ten square miles—but the foreshore is of the same general character. As at Lake Newell the small hills within the valley, into which the water was turned to form the lake, have been isolated and are now islands.

In 1922 the lake has been in existence for only three years and aquatic plants had not become established but eventually, no doubt, the conditions which make Lake Newell so attractive to water-fowl—the growth of aquatic vegetation there is phenomenal—will here be duplicated as in both cases the water comes from the same source, the Bow River.

Although bare of aquatic vegetation, at the time of my visit, water-fowl evidently found the lake attractive enough and broods of young Pintail, Gadwall and Lesser Scaup were common. A brood of young Pintail was escorted by two females, one in the lead, the other bringing up the rear. One empty Pintail's nest—this was the commonest duck—had been built under a mass of blown tumble weed but the chief nesting grounds were the small islands where safety from attack by predatory animals is assured. At this season the drakes were associated in flocks and several had congregated on the lake. One gathering estimated at 300 contained Pintail, Gadwall, Shoveller, Lesser Scaup and White-winged Scoter.

Disturbed from a small island a flock of Franklin's Gulls, estimated at 2000, rose in detachments and flew westward to disappear over the horizon of low hills. Solitary Ring-billed Gulls and California Gulls flew low along the beaches or rested on the island shores. These were not nesting, neither were the less plentiful Common Terns, nor the six pairs of Eared Grebe which were encountered on various parts of the lake.

The Avocet population was estimated to contain thirty pairs, the majority being accompanied by young in various stages of development from downy youngsters a few days old to those nearly as tall as their parents. The guardian parent when excited by our presence walked along the edge of the beach in a crouching attitude with wings half extended and bent downward, or swam in the shallows with wings partly extended on the surface of the water. Killdeer also were abundant, twenty broods being counted, but, surprisingly, no Marbled Godwits or Western Willets could be found and only two Wilson's Phalarope.

Of migrant waders, Baird's Sandpiper was the commonest. These in small flocks we found amongst the short grass fifty yards or more distant from the water's edge. Several bands of Least Sandpiper and one Stilt Sandpiper also were noted.

It was of interest to see how land birds had taken advantage of the artificial nesting sites provided by the irrigation project. Under the cap of a concrete structure at the lake's outlet a large colony of Cliff Swallows nested. Here, also, a pair of Say's Phoebe had taken up residence and twenty pairs of Bank Swallows were in possession of the high banks, forming the sides of the main canal. Obviously these species were recent additions to the local avifauna.

* J. A. Munro. The Canadian Field-Naturalist 36:89.

PAUL LAKE, BRITISH COLUMBIA

Paul Lake is situated twelve miles north-east of Kamloops within the Niskonlith Forest Reserve at an altitude of 2800 feet—1500 feet higher than Kamloops. The Kamloops Indian Reserve Number 1, adjoins the north shore at the east end of the lake for a distance of one mile and one-eighth, more or less. Within recent years the lake has been widely advertised as a summer resort—the trout fishing is excellent and bathing is also an attraction. Mr. J. Arthur Scott operates a summer hotel and in addition there are generally twenty to thirty camps during the summer months.

Lying east and west, the lake is roughly three and a half miles long and half a mile wide at the widest point. The shores are precipitous at some points, elsewhere are narrow beaches of sand or shingle, and, for the most part, the forest extends practically to high-water mark. Half way down the lake on the north side is a bold perpendicular rock bluff several hundred feet in height, the most prominent feature of the landscape. The general aspect of the surrounding region is that of a typical Canadian Zone forest—composed chiefly of Lodge-pole pine and Douglas fir—covering a succession of low mountains to their summits.

At both ends of the lake are small areas of shallow water; elsewhere the lake is deep, the water fresh and clear—being fed by several streams of fair size and drained by Paul Creek into the Thompson River. Apart from the shallows referred to the lake is too deep to offer much attraction to water-fowl but in the limited shallow areas various of the food-plants eaten by ducks are represented. Specimens of the following were collected; *Potamogeton pusillus*, *Potamogeton natans*, *Potamogeton pectinatus* and *Myrophyllum spicatum*. Along parts of the shore bordering the shallows is some bog-rush and bullrush growth, amongst which was found plants of water Horehound (*Lycopus lucidus*) the fleshy tubers of which are eaten by ducks. Molluscs belonging to the groups Limnaea and Plenorbis are fairly common. Excepting one pair of Loons and Mr. Scott's tame Mallard no water-fowl were seen on the lake during my visit. With reference to Mr. Scott's work in propagating Mallard, it may be stated that so far this has been successful. His flock, although seriously depleted by Horned Owls, now numbers thirty-eight. These birds were not reared in confinement and are free to come and go as they wish. In the evening they come to feed near Scott's hotel and usually roost on the beach for the night. During the winter months a hole in the ice is kept open for their use and at night the birds are housed. Mr. Scott stated that his birds attracted a number of wild Mallard to the lake last autumn and that several of the wild birds remained with his flock. Canada Geese were also noted on the lake several times. This species had not previously alighted according to Mr. Scott's observations and he attributes their doing so last year to the presence of the tame Mallard.

The value of the adjoining lands as a game refuge is evident, and this area is entirely forested mountain slope of no agricultural value. Blue Grouse, Franklin's Grouse and Ruffed Grouse occur in fair numbers, also black bear and deer, a few beaver and muskrat are still found in the lake. Insectivorous bird-life is limited both in species and individuals as could be expected in coniferous forests of this type. Several Pileated Woodpeckers were noted, the only species for which special protection is considered necessary at the present time.

TUNKWA LAKE, BRITISH COLUMBIA

The district known as Summer Range which includes Tunkwa Lake comprises some five thousand acres of semi-open, undulating prairie, situated on a plateau at a mean elevation of 4000 feet, in the upper Nicola country. The timber on this range, chiefly Lodge-pole pine, occurs in small stands and isolated clumps. The trees, being set far apart have developed laterally and present quite a different appearance from the tall, slim forest type. These open park-like woods are free of under brush and grown up with grass.

The Merritt-Savona road angles through the south-easterly portion of the district, and, a short distance north of where it enters the prairie, two trails lead off to Tunkwa Lake, one reaching the south end of the main lake and the other leading to the upper and smaller lake.

Scattered through the district are many ponds and small lakes, some of which were dry on July 15th, 1923. One in the S.W. $\frac{1}{4}$ of Section 10 is a shallow algæ-coated pond about one acre in extent. On the east side is a low open hill, elsewhere it is surrounded by a grassy flat, perfectly open except for a small stand of Lodge-pole pine near the south end, which would be fifty yards distance from the pond at high water. Some of the smaller ponds contain bog-rush and other aquatic plants but the foregoing description with a few topographical modifications can be applied to all the small lakes. A much larger lake, in the N.E. $\frac{1}{4}$ of Section 10 and the S.E. $\frac{1}{4}$ of Section 15, is deeper, with clearer water and has some cover along its shores.

These lakes lie in the western portion of the

plateau and are connected by a small stream which will be referred to later. The main lake, at an elevation of 3900 feet, is approximately 160 acres in extent while the upper lake is a third of this size at a slightly lower level.

The open grassy prairie, characteristic of Summer Range, surrounds lower Tunkwa Lake, and for the most part, the scattered timber is some distance from the water. From almost any point on the shore one can obtain an unobstructed view of the lake which is more or less circular in shape with an irregular and deeply indented shore-line. To the west, forming a barrier on that side of the prairie, a timbered mountain rises to a height of approximately 1000 feet, the summit being about two miles distant from the lake.

High water mark is defined by a bank two to four feet in height from which glacial boulders of various sizes have been washed and lie scattered on the upper beach. Below this the receding water has exposed a margin of hard clay which is general around the lake. Near the south shore is a small stony island which would be submerged at high water. At this end of the lake, also, are two grassy points with stony beaches which probably are disconnected from the mainland at high water.

From the south east corner of the lake extends a narrow arm or channel widening at the end to a fair-sized pond. The pond is partly surrounded by open timber and this cover also extends over a low ridge on the south side of the channel. The connecting channel is now dry and its exposed clay bottom and the shores of the pond are covered with dry algæ.

This channel and the grassy points referred to above are probably the best shooting places on this portion of the lake. At the end of one point were found the remains of several duck-blinds which had been built by digging out a portion of the bank and piling a wall of boulders along the front and sides. Many empty cartridge cases indicated that much shooting had been done from these blinds. No doubt there are also various passes through the open timber, used by ducks when flying from Tunkwa Lake to the adjacent sloughs or to Mammit Lake fifteen miles south.

A smaller more marshy lake, in Section 8, is connected with the main lake—approximately 300 yards distant—by a narrow free-running stream winding through a shallow open draw. Small areas of bog-rush were noted along the shores and a luxuriant growth of Coontail was general. On one of these Coontail beds, a Holboell's Grebe was sitting on her exposed nest. Apparently no other water-fowl, save a pair of Loons, were breeding on this lake although it appeared eminently suitable as a breeding ground.

Upper Tunkwa Lake is similar in general character to the main lake except that the shores in several places are steep and covered with timber. The three hundred yard strip of open country between the two lakes rises in a gradual slope from the lower lake to a height of approximately forty feet and then drops abruptly to the shore of the lower lake. The only break in this ridge is a shallow draw, deepening to a gully at its northern end where the ridge is highest. Through this gully flows the narrow stream connecting the two lakes. A dam has been built across the deepest portion of the gully in order to hold back the water for irrigating purposes. For the most part the ridge is open—sandy and rocky soil supporting a scant growth of grass—but scattered Lodge-pole pines occur along the gully and in several other places. Wherever this cover occurs an accumulation of empty cartridge cases was found. The position and character of this ridge render it particularly suitable for flight shooting, as ducks must constantly be passing from one lake to the other.

Both lakes contain a food supply sufficient to provide for an enormous number of ducks. This includes leeches, fresh water shrimps (*Gammerus limneus*), molluscs and duck-weeds of various species. The shore line in many places was strewn with fragments of *Potamogeton pectinatus* and an unidentified plant which apparently had been pulled up for its tubers.

At the south end of the lake three flocks of Lesser Scaup were seen, one on the island before referred to and two in the water close to shore—the total number being estimated at 300. All were drakes and the majority were in full eclipse plumage. Five drake Pintail—also in eclipse—several Barrow's Goldeneye, a mated pair of Ring-necks and one Greater Yellow-legs also were seen. Owing probably to the scarcity of cover—there is no brush near the shore and few rushes—the Tunkwa Lakes do not attract many breeding ducks. It seems probable, however, that the abundance of fresh water and food attracts large numbers of birds during the autumn migration. That they are attractive lakes is evidenced by the presence of large flocks of male Scaups in July—birds which had probably bred some distance farther north, perhaps in the Cariboo District.

LEW LAKE AND SCUITTO LAKE, BRITISH COLUMBIA

These lakes are situated in a narrow valley, running in a westerly direction from an open

plateau country at a mean elevation of 3200 feet, south of the Thompson River in Township 18, Range 16, west of the Sixth Meridian. The plateau is reached by a steep switch-back waggon road that leaves the Kamloops-Vernon Highway about one mile east of Barnhart Vale, winds up hill for six miles, passes through a long poplar draw on the summit and then enters rolling prairie country.

Owing to the southern exposure of the major portion of the plateau forest conditions are only slightly modified from those of the dry-belt Transitional Zone in the valley two thousand feet below, and the average rain-fall is not greater. The predominating conifers are Yellow pine and Douglas fir—not Lodge-pole pine as might be expected at this altitude.

An agricultural settlement was started in this district about 8 years ago and in spite of the ever-recurring crop failure, due to drought, a number of settlers are still on the land. This year (1923) there has been a phenomenal rainfall—a condition that has been general through the dry belt—and there is every promise of a crop.

A rough wagon trail, part of which is passable by motor car, leaves the main road from Bestwick Post-office at the East end of Lew Lake and continues westward through the valley along its northern side, to the east end of Scuitto Lake. The open prairie-like country which prevails over most of the plateau, ends rather abruptly in the eastern portion of the N.E. quarter of Section 26, and travelling along this road one enters an open, grassy, park-like country of Yellow pine and Douglas fir which continues along the north side of the valley, to the west end of Scuitto Lake. On the south side of the valley, however, owing to its northern exposure, conditions are entirely different, the predominating conifer is Lodge-pole pine and zonal conditions are Canadian rather the Transitional.

The easterly portion of Lew Lake is surrounded by the open rolling type of country which prevails over most of the plateau to the south and east. Near the shore are occasional clumps of willow *Salix* (sp?) and small stands of Trembling Aspen, *Populus tremuloides*. Farther west on the north shore this gives place to sloping grassy side-hills and the open type of Transitional forest, described above, while the north shore, beyond the prairie area, is much rougher in character and predominately Canadian in its forest conditions. Halfway down the lake on the south side—in the south half of Section 26—a timbered mountain rises abruptly from the lake and there is no beach margin. Other portions of the shore are muddy and grown up with bog-rush which reaches its greatest development in the shallow bays. Here also, are found wide beds of *Ceratophyllum demersum*, *Potamogeton pectinatus*, and other aquatic plants, the fresh, clear and moderately warm water being suitable to the growth of this vegetation.

Trout have been introduced in this lake, but, owing possibly to the abundance of *Gammerus limneus*, upon which they feed, these fish are rarely caught. No doubt this fresh-water shrimp is one of the chief foods of water-fowl also. They were seen in such numbers in the quiet eddies of the creek, which is described later, that a double handful could be scooped up without difficulty.

Continuing westward on the trail along the north shore it is seen that Lew Lake—in Section 27—gradually narrows into a shallow creek which flows into Scuitto Lake, half a mile to the west. The littoral is similar to that of the lake—open park-like Yellow pine and Douglas fir forest on the north and heavy forest on the south. In some places on the north shore are wide, open, grassy glades, sloping gradually south from the creek's edge—which is defined by a line of firs towering above the dense margin of willow—to an open forest farther up the hill. This willow brush hides much of the creek from one passing along the trail and would afford excellent cover for duck-shooting.

The creek is really a succession of quiet pools, grown up along their margins with tules (*Scirpus*) and connected by rapid stretches of water with rocky bottom and shore. A small boat could be used to advantage, and only short hauls would be needed over the shallow rapid portions.

Scuitto Lake has no area of prairie along its shores, such as prevails at the east end of Lew Lake, but the conditions otherwise are similar—open park country on the north and thick forest on the south. The marsh areas are perhaps larger and tule beds are more plentiful. Opposite the mouth of the creek, which flows into a narrow arm of the lake, is a small rush-fringed island and on the south shore is a tule-lined bay.

Scuitto Creek, which drains the lake from its most southerly arm, flows north and empties into the Thompson River. The water from this creek is used for irrigating purposes by the residents of Barnhart Vale in the valley below, and, to ensure an adequate supply, it has been proposed to hold back the water in Scuitto Lake, a scheme which would work no ill-effects.

Both these lakes and the connecting creek are suitable in every respect as breeding grounds for water-fowl. Paired Scaups, broods of Buffle-head, Barrow's Golden-eye and other unidentified ducks were seen and it is believed that an in-

tensive survey would prove this area to be one of the best breeding grounds in the district. Fresh water and the apparently unlimited supply of the vegetable and animal food eaten by ducks would make these lakes most attractive to migrating ducks. Their value from the sportsman's standpoint, therefore, is very high.

(To be continued)

BARNEY WOODCHUCK

By INGRID LARSEN

EARLY one May morning the boys set out on their bicycles to hunt Woodchucks with the expectation of pocket money as the Fox Farm owners pay well for these lowly diggers, dead or alive. After leaving their bicycles at a farm house they very soon spotted Mr. Woodchuck sitting upright, just beside his hole but he was much too quick for them and down into his home he went. The boys weren't discouraged and began trying to smoke the little fellow out and, to their surprise, they heard strange sounds from within where they later found baby Woodchucks. Said one, "Wouldn't it be just great to take a baby one home!" So this is how Barney came to live with us, at Braeside, Ontario.

Barney was so tiny that we had to keep him in a cardboard box about six inches long. The poor little fellow seemed awfully frightened at first but after a while with tender care and spoon-feeding with hot milk he began to like his surroundings much better and even looked forward to his meals which were now changed to bread and milk. He learned to know his exact feeding hours and sometimes if his meal happened to be delayed a few minutes he was "Barney on the Spot" ready to jump right into the breadbox, which he often did if not carefully watched. He thrived and grew to normal size on this diet so naturally we had long before this dispensed with the cardboard box for a bed in a clothes cupboard—the door of which he learned to open himself after a few strenuous efforts.

Soon came the warm summer nights which seemed to entice him to outdoor life. So he took to his instinctive habits of digging and made himself a hole in the ground but never forgot his real home nor failed to be on time for his meals although he slept out every night. A very strange thing about his habits was that he would eat blades of grass, weeds, etc., but never once did he touch our vegetable garden nor destroy the shrubs or trees. His digging efforts were very brisk at all times but he confined his labors to exactly one spot—his first and only hole which was surprising as we all had visions of seeing holes everywhere.

Among the things he loved to eat were prunes, bananas and candy. His great delight was to eat the chocolate coatings and throw away the cream centres. Once the boys gave him chewing gum; this he managed to get stuck all over his paws and fur. His fore-teeth also became so gummed up that the poor fellow certainly looked very comical indeed.

About the first week of July we began to miss things. Handkerchiefs, dusters, newspapers, mysteriously disappeared and to our surprise we found Barney was the culprit. Apparently he was starting his Winter home as everything we missed was away down deep in that hole. This proved to be the case, because as early as August 17th he deserted us. We, of course, thought he had been killed or had run away as this date seemed altogether too early to start his long winter sleep. However, sleeping he must have been, because on March 17th he first appeared above the ground but far from the spot where he had entered. During his sojourn he had burrowed over forty feet, right to the base of a large oak tree.

We were, of course, delighted to see our friend again and he certainly hadn't forgotten us because he walked right into the house just as if nothing had happened during the past seven months, stood up and grasped one of the boy's hands welcoming him like a long lost brother. But poor Barney had changed. He was so thin and weak, although his appetite was amazing. He simply guzzled everything we gave him with the greatest gusto and his first diet of bread and milk seemed to please him more than anything else.

Soon he was his little fat self again and stayed with us all the Summer, seemingly enjoying our hospitality and still continuing his playful tricks such as creeping into bed with the boys in their tent or finding one door closed would scamper to another one endeavouring to visit the girls upstairs in their bedrooms to wish them "Good Morning".

However, it was our lot to lose him. Wild Life in the form of a mate, who appeared on the scene in August, lured him away and it was only a few days after they first met that we lost our dear pet Barney.

FIFTY-FIRST ANNUAL REPORT—OTTAWA FIELD-NATURALISTS' CLUB

During the past year four meetings of Council were held at the following residences of its members:—Messrs. Hoyes Lloyd, two meetings, P. A. Taverner, and C. M. Sternberg. The average attendance was 14 which is approximately 50% of the membership in Ottawa.

One lecture was delivered during the winter. Prof. Arthur Willey, of McGill University, addressed the Club on "A Zoologist's Souvenirs from East to West".

One of the outstanding functions of the year was the celebration of the Club's fiftieth anniversary by a dinner held at the Daffodil Tea Rooms on March 19th, 1929. The success of this affair was due to the efforts of Mr. P. A. Taverner, the Chairman of the Lecture Committee, and a very faithful worker. The following Founders were invited as guests of the Club: Dr. H. B. Small, H. O. Gray, W. L. Scott, Col. A. H. Todd, Dr. H. M. Ami, P. B. Symes, Mrs. W. P. Anderson, Frank Newby, W. Chesterton, T. H. Chrysler, and Roger Davey. Unfortunately only two of these gentlemen could attend, Dr. Small and Mr. Davey, the former giving a short and interesting address on the formation of the Club in 1879. Fifty-two members and their friends attended this function. In the course of the evening musical numbers were presented by Mrs. Dan. MacDougall, and Mr. R. J. C. Fabry.

Four excursions were held during the month of May, the first on Geology at Val Tetreau; the second on Amphibians at Rockcliffe Park; the third, and the most popular, was on Birds and other Natural History at Fairy Lake. The attendance at this excursion was not so large as in former years because of the non-attendance of the Normal School Students. The fourth was on botany. At the conclusion of each excursion a short talk was given by the leaders. The average attendance was about 35, somewhat less than in former years. Mr. Miller, last year's Chairman of the Excursions Committee, was unable to be present on account of illness, and his duties were assumed by the Secretary.

The Council was asked to furnish a member of the Club for the local committee for the Preservation of Wild Flowers, and selected Mr. Herbert Groh. Messrs. Hoyes Lloyd, and Dr. Harrison F. Lewis, on the International Committee for Bird Protection, continued as representatives of the Canadian Section.

Under the terms of the will of the late R. B. Whyte, Founder and first Secretary-Treasurer of the Club, the Club has received $100.00 per annum since his death. This terminated with the death of Mrs. R. B. Whyte in 1928.

During the month of July the Club received from Messrs. Norman and Adam Ballantyne, Executors of the will of the late Miss I. M. Ballantyne, who was a long standing member of the Club, also in commemeration of the late Mr. Ballantyne, who was an early member of the Club and took a keen interest in its welfare, a cheque for $100.00 and a set of back numbers from 1885, Volume 2 to 1926, Volume 40. The Secretary has written the Clubs' appreciation and thanks. Council decided that this money should be added to the Reserve Fund.

One of the affiliated Clubs, the Hamilton Bird Protection Society, discontinued affiliation during the year. The Secretary has been in communication with Mr. Gower Rabbitts, Secretary of the Newfoundland Game and Inland Fisheries Board, who has requested a copy of the Clubs' Constitution and By-laws as an aid in forming a Naturalists' Society there.

Mr. Hoyes Lloyd, Chairman of the Publication Committee, and one of the most energetic workers of the Council and Club, submits the following report: "One of the chief functions of this committee is the issue of the Club paper, the *Canadian Field-Naturalist*. It is felt that the current volume of the paper speaks for itself. The material furnished by authors has been of a high degree of excellence. The Editor, Mr. Douglas Leechman, working in close harmony with the printer, Mr. H. C. Miller, has had the paper issued without fail on the first business day of the month throughout the *Naturalist's* year. It is doubtful if this achievement has ever been equalled before in our history. Mr. Miller, our printer, is a busy man, but he has always found time to care for our interest and it is largely due to his untiring efforts and advice that the Editor has been able to issue the paper so promptly. The Committee desires to point out that the cost of publishing the *Naturalist* considerably exceeds the receipts from membership fees, the difference being made up from the general resources of the Club. Increased membership would place more funds at the disposal of the Committee and enable the Club to issue a better paper especially in the way of being better illustrated. The committee reports that an improved quality of book paper is out of the question at present. Practically the only book paper available today is ground wood pulp, the life of

which is limited. Not only our record, but practically the entire record of science of today, is on such paper which will not stand the ravages of time. The Committee held eight formal meetings for the conduct of the Clubs' business."

The very efficient and hard working Honorary Treasurer, Mrs. Wilmot Lloyd reports that the Club has a surplus of $428.00. which is a remarkably fine showing considering that the membership now stands at only 465, considerably less than last year. The cash surplus is the biggest for a number of years. During the year a complete set of back numbers was sold in Germany. The club now possesses a Victory Bond valued at $1050.00, an additional $550.00 bond having been added to the original bond purchased in 1925.

During the year the following resignations were received with regret. Mr. Clyde Patch, first Vice-President, resigned from the Club, and his place was filled by the second Vice-President, Dr. Harrison F. Lewis. Mr. C. M. Sternberg, a member of the Council, was elected second Vice-President, Later in the year the President, Mr. E. F. G. White, resigned from office; this resignation was still before Council at the termination of the Club year. Dr. Ralph DeLury, who was elected Secretary-Treasurer, could not fill the office through pressure of work and Council again separated these duties, and elected Mr. Bertram A. Fauvel, last year's Honorary Treasurer, to the position of Honorary Secretary and Mrs. Wilmot Lloyd to that of Honorary Treasurer.

It is regretted that the Club lost through death two Founders: Messrs. P. B. Symes and H. O. Gray.

In retiring from Office your Council feels that the past year has been successful both financially and otherwise but urges all members to try to increase the membership for the coming year to enable the Club to issue a better paper, especially in the quality of illustrations. To the incoming executive and Council, we wish every success on the Club's entering the 52nd year of its existence.

HARRISON F. LEWIS. *Acting President.*

BERTRAM A. FAUVEL, *Honorary Secretary.*

1st Dec., 1929

STATEMENT OF THE FINANCIAL STANDING OF THE OTTAWA FIELD-NATURALIST'S CLUB AT THE CLOSE OF THE YEAR 1928-1929.

ASSETS		LIABILITIES	
Balance in Bank	$428.33	Balance	476.63
Unpaid dues 1929	6.00		
Bills receivable	42.30		
	$476.63		$476.63

RECEIPTS		DISBURSEMENTS	
Balance in Bank	$313.06	Printing "Naturalist"	$1302.85
Membership dues:		Editor	90.00
Current	1096.77	Separates	190.83
Advance	75.05	Illustrations	134.86
Arrears	68.75	Postage, Stationery, Incidentals	101.50
Advertisements	59.45	Advance, Reserve Fund	11.79
Back Numbers	238.20	Exchange	22.57
Separates	317.42	Anniversary Dinner	14.50
Illustrations	104.24	Balance in Bank	428.33
Donations, Credit Note, Refund from Reserve Fund	24.29		
	$2297.23		$2297.23

Audited and found correct.
A. G. KINGSTON
HARRISON F. LEWIS
Auditors.
Dec. 9, 1929.

WILMOT LLOYD, *Treasurer.*

STATEMENT RESERVE FUND

November 26, 1929.

RECEIPTS		DISBURSEMENTS	
Cash in Bank, Nov. 23, 1928	$556.64	Bonds	$556.80
Interest from Bonds	57.75	Interest	11.11
Interest from Bank	13.17	Brokerage	.68
Ballantyne Estate	100.00	Refund to General Funds	11.79
Advance, General Funds	11.79	Balance	158.97
	$739.35		$739.35

ASSETS

Victory Bonds, 1934 Issue	$1050.00
Balance in Bank	158.97
	$1208.97

Audited and found correct.

A. G. KINGSTON
HARRISON F. LEWIS
Auditors.

Dec. 9, 1929

W. T. MACOUN,
Chairman Reserve Fund,
O.F.-N.C.

WILMOT LLOYD,
Treasurer.

NOTES AND OBSERVATIONS

THE PIGMY SHREW NEAR OTTAWA.—We were interested in Mr. C. E. Hope's note in the Naturalist for October, 1929, which recorded the taking of a Pigmy Shrew (*Microsorex hoyi hoyi* (Baird)) in the Toronto district; two days before the article came to our notice we trapped a Pigmy Shrew near Leitrim, 10 miles south-west of Ottawa. The shrew was caught in a small mouse trap baited with cheese and was caught in such a way that the determination of sex was impossible. The small size of this shrew led us to suspect that it was a pigmy although we knew of no record of this mammal in the Ottawa district. The specimen was brought in to Mr. C. E. Johnson who very kindly put it up as a skin. Through the kindness of Mr. C. H. Young we were enabled to compare our specimen with those in the National Museum and the dentition of our shrew appears to be identical with that of Pigmy Shrews in the Museum collections. The measurements of our specimen differ somewhat from those of Mr. Hope's and both are given below for comparison:

	Total length	Length of tail	Length of hind foot
Toronto sp.	87 mm.	31 mm.	10.5 mm.
Ottawa sp.	73.5 mm.	25 mm.	9 mm.

The skin and skull of this interesting specimen have been presented to the National Museum of Canada.

As far as we are aware this is the first record of the Pigmy Shrew in the Ottawa district; however, should any reader of this note know of a previous record we should be glad to hear from them.—D. BAKER AND A. LA ROCQUE.

A TREE CLIMBING WEASEL.—On November 3rd, 1929, the writer and a companion were walking up the Humber Valley at Toronto when we were attracted to a certain spot by the excited calls of a group of small birds—Juncos, Tree Sparrows, Nuthatches and Chickadees. As we approached, the birds scattered and a slim brown form darted up the trunk of a small oak and hung there, squirrel-fashion, a few feet from the ground.

We saw at once that it was a weasel, probably *Mustela noveboracensis* (Emmons), and we advanced expecting to see it drop to the ground and disappear among the leaves and brush. However, to our surprise it did not do so but ran on up the trunk and did not stop until among the upper branches, about twenty feet from the ground. We shook the tree vigorously but Mustela simply hung on staring at us intently all the while with its dark, ferocious looking eyes.

It is well known that the weasel occasionally climbs trees but though I have seen a good many under various circumstances, I had not before seen one so deliberately leave the ground for no

apparent reason.—R. J. RUTTER, 48 Burgess Ave.

CONCERNING THE BURDOCK SEED GELECHIID.—Observation recently in the Western provinces of the complete freedom of burdocks from infestation by the Burdock Seed Gelechiid (*Metzneria lapella*), led to examination of the burrs of this weed at each of the several stop-overs on the journey eastward. At Rainy River, Ont., and at Port Arthur no infestation was found, but at North Bay the burrs were as full of the larvae as they are ordinarily found to be at Ottawa and other eastern points.

At Ottawa careful inspection of hundreds of burrs, has shown that an average of more than 90 per cent. of the seed heads are infested with one to several larvae. As many as four may be found in a single head, resulting in such cases, in the destruction of most of the 15 to 25 or more seeds in a head. Quite obviously the normal seeding of the burdock is seriously affected, and since propagation of this weed is by seed alone, there may be in this a partial explanation at least, of its relatively unimportant place among Ontario weeds at the present time. Probably few farmers would now include burdock in a list of their worst weeds, yet in 1893, Prof. J. Hoyes Panton found it ranking fifth in a list compiled from 1015 replies to a circular enquiry as to the ten worst weeds locally in Ontario.

The Burdock Seed Gelechiid is an Old World insect first discovered in Canada at Levis, Que., in 1898, by the Rev. T. W. Fyles. It was reported at Ottawa in 1902, and at Toronto in 1904. The subsequent 25 years might have been expected to see a greater spread, than available records, and the observations here reported would indicate.

For additional information on this insect the reader is referred to an interesting short article by Mr. Arthur Gibson, in the Ottawa Naturalist, October, 1914.—HERBERT GROH.

NEST-ROBBING (?) BEARS.—During the summer of 1929 I came across a heronry on the shore of a small lake about twenty-five miles west and a little north of Sudbury, Ontario. One set of four nests perched one above the other on a very tall ram-pike particularly caught my eye. Some prospectors told me that a bear had cleaned out these nests some weeks previously. The next time I passed I looked at the tree. From the scratches on the trunk there was no doubt that a bear had climbed it and the two lower nests were rather dilapidated while the upper ones were apparently untouched.—A.G. HAULTAIN, *Geological Survey of Canada.*

An account of the unusual movement or migration of Canada Jays that has been taking place since last summer and is still going on is being prepared by Harrison F. Lewis, National Parks of Canada, Ottawa, Canada, who will appreciate any information, however scanty, relating to this subject.

EXTENSION OF RANGE OF *Esox americanus* (GMELIN).—As a member of the Brodie Club, Toronto, I should like to record the taking of a specimen of a new pike for Canada. On June 18th, 1929, Mr. S. J. Bochner, chemist, and myself, working for the Ontario Department of Game and Fisheries Research Laboratory, Port Dover, seined two small pike in shallow weedy water at Pottahawk Point, Long Point Bay, Lake Erie. One of these differed from *E. lucius* the common pike of the locality and has since been identified by Mr. J. R. Dymond, Department of Biology, University of Toronto, as *Esox americanus* Gmelin = (*E. vermiculatus*). The specimen measured 9.2 cms. total length. No others were taken in forty-five further seine hauls in the Bay.

The literature does not appear to contain any Canadian record of this species, the range of which Weed gives as "from somewhere in Maine or New Brunswick southward into Florida, westward into Texas, up the Mississippi Valley into Southern Wisconsin and down the Great Lakes into Western New York."—A. E. ALLIN.

STATUS OF CANADA GEESE ON THE VASEAUX LAKE BIRD SANCTUARY, BRITISH COLUMBIA.—It is very gratifying to be able to report the great increase of Canada Geese within the Vaseaux Lake Bird Sanctuary. This increase has been very rapid since the reservation of the Sanctuary in 1923, at which time I believe there were very few Geese breeding here.

In the spring of 1928 I estimated fifty-five pairs of Canada Geese nesting within the Sanctuary and a careful count of the nests was made by me. While the spring of 1928, with its high water and long continued flood conditions was an unfortunate one for the majority of waterfowl, in this district, other waterfowl, had finished incubating before the flooding of the valley bottom became serious. I could only find two flooded nests of the species.

While Canada Geese were present in the Sanctuary in small numbers throughout most of the winter, the majority of the breeding birds did not arrive until towards the end of February, when they began to appear in pairs on the ice. They were most numerous in the vicinity of the island at the Southern end of the Lake. Here

they were very noisy and there appeared to be a number of non-mated birds there, evidently year old birds, and daily fights occurred between these and the mated pairs.

Owing to the ice, I was unable to visit the island until the 24th of March, at which date some of the Geese had already commenced to incubate. On landing on the island a number of nests were seen, but, not wishing to disturb the Geese, I only looked over a small part of the island.* Visiting the island again a few days later, I counted thirty-five incubating Geese on it, and no doubt others escaped my observation. This island is an excellent breeding ground for the Geese. It is wooded and also covered with low bushes, which afford cover for the nests, and another factor in its favor is that the incubating Geese are safe from Coyotes.

On the marshes at the Northern end of Vaseaux Lake the Geese were also breeding. Here several nests were seen on Muskrat houses and one on a large, flat-sided, cedar log which was floating amongst the reeds. Other nests were seen amongst bushes on islands in the river. The largest number of eggs I noted in a nest was eight, but six eggs was the usual number.

During the summer months I only visited the Sanctuary at intervals, and would often observe numbers of Geese there. In the autumn they were to be seen flying to and fro between Vaseaux Lake and Osoyoos Lake resorting to both lakes to feed. On one occasion I counted 400 Geese, and I believe these are our local Geese.—S. J. DARCUS.

THE INCREASE OF THE STARLING.—When I saw three thousand Starlings in London last Fall I thought that Middlesex must be nearly the centre of abundance. On the 21st of March, at Brantford, in company with Mr. Angus Buchanan, I watched a flock which we estimated at about ten thousand, as they circled around and lit in the trees, preparatory to the night's sleep. Mr. Eddy has a young forestry plantation, some of which is about twenty years old, and it was in the white and Scotch pines that they were apparently intending to roost, but they first alighted in the large elms and oaks, and from them they came down in small companies to the evergreens. While going through the little forest we came to some owl pellets and I was in hopes that we should find Starling bones in them, but there was nothing except the usual mice, mainly Microtus. If our Screech Owls would change their habits so as to hunt in Starling roosts they would become a very valuable aid to controlling the threatening numbers of this foreigner.—W. E. SAUNDERS.

CROSSBILLS.—Crossbills are erratic birds as everyone knows and we who see them in Winter know only half of the story. We should be very much surprised if Robins came to us every third or fourth year and nested in large numbers and absented themselves in the interval, yet this is just what the Crossbills do, and definite information on this bird is not very frequently obtained. I was once talking to the late John Macoun and told him of the experience of my brother, F. A. Saunders, and myself, in Algonquin Park in 1908 when the White-winged Crossbill was the commonest bird, and I felt sorry I was unable to collect a few of the young birds, which are so rare in collections. He told me that he had been there a few years before and had found them very numerous and in the early Spring following he sent a collector to study the life-history of this species and collect a series of specimens. But this time the crop of cones on the white and black spruces had failed and the Crossbills were not there; and on no subsequent visit have I seen Crossbills in numbers.

I quote the following from a recent letter from Mrs. Anna E. MacLoghlin, Hamilton, Ontario, referring to a similar occurrence in her experience:—

"The American Crossbills were so thick there (Sand lake, three miles South of Algonquin Park) in June 1922, before the guests came, that they even flew in the cook-house windows and Mrs. Hill found two dead on the floor one day.

"I was there again on August 20, and for some weeks the Crossbills were very abundant; a few of them being White-winged Crossbills. I never spent a more interesting holiday than I did that year. The birds would swirl down almost at my feet and wherever I went in woods on both sides of the lake, their sweet little voices could always be heard. That was a rare time for they have never been seen there since."

These occurrences were in about the years 1903 or 1904, 1908 and 1922 and it is reasonable to suppose that they have been abundant in the Park in other years at possibly four or five year intervals. It is too bad we could not get prompt information of their abundance so that it would be possible to visit the Park when they were there in quantity and get thoroughly well acquainted with them.—W. E. SAUNDERS.

UNUSUAL MIGRATION OF REDPOLLS (*Acanthis linaria*).—While motoring along the Yellowstone

* Only three (3) pairs of Canada Geese nested ou this island in the summer of 1919.—J. A. Munro.

Highway, west of the city of Chamberlain, South Dakota, March 23rd, 1929, I witnessed for three hours, a most remarkable migration of Redpolls towards the north. Shortly after crossing the Missouri river the birds were encountered in tens of thousands. The fields on all sides seemed alive with them, feeding on the weeds for a few moments before continuing their journey. They crossed the roads running east and west in tremendous flocks, so low that many were killed by flying into passing automobiles. During the three hours that morning I slowed up many times so as not to run into the myriads of birds as they drifted across the highway. Turning into the north and south roads we found the birds feeding along the sides or moving in solid flocks towards the north. The morning was warm and springlike, following a cold spell of several days and it looked as though the birds had decided all at once to try and make up time, which had been lost. The width of this migration wave was less than one hundred miles. As we drove along we tried to estimate the number of redpolls seen in a mile, and our most conservative figure was ten thousand. We also counted the dead birds on the highway and found as many as twelve to the mile on several stretches. Before noon we ran into country covered by several inches of snow and there the migration ended just as suddenly as we encountered it. In three hours I saw more redpolls than I had ever seen before in forty years of bird observation. One naturally asks, why this concentration of the species, and whence were they going?

Redpolls are fairly regular winter residents in good numbers in Alberta. Each spring in late March or April flocks varying in size from fifty to three hundred reach this latitude from the south, often remaining with us for a week or more before departing for the spruce forests to the north and west. Possibly such flocks are the remnant of the main body which gathered and travelled along the eastern slopes of the Rockies.—FRANK L. FARLEY.

WINTER RECORDS OF TOWHEE AT TORONTO.—The report of Ida Merriman in *The Canadian Field-Naturalist* for October 1929 of a Towhee (*Pipilo erythrophthalmus*) at a Toronto feeding station in February 1929, brought to mind the fact that there are few, if any other published winter records of this bird from Toronto. I have in my notes a record of a male Towhee seen at Toronto on December 12, 1926, when there was snow on the ground and the weather very cold.

The Towhee is not considered to be even an irregular winter resident here but perhaps these two records will bring forth others and show that it is not so unusual in winter as we think.—R. J. RUTTER.

THE PRESENT SCARCITY OF THE FIELD SPARROW AT TORONTO.—My first acquaintance with this splendid songster was made on the morning of April 26, 1921 at Moore park, Toronto, on which occasion the bird was very common and was heard singing from all directions. Subsequent visits there during that spring and summer and during the spring of 1922, with Mr. Russell G. Dingman and others, revealed the Field Sparrow as quite common in that locality, and also, to some extent, in other parts of the Toronto region. In 1923 I regularly visited its favorite breeding-ground at Moore park but a decided decrease in the number of Field Sparrows was noted, and, with the exception of several noted on May 1, I saw only about ten individuals in the region about the city during the whole season. Since that time the species has been rare at Toronto in my experience and not since May 1, 1923, have I noted it in any numbers.

In 1907 Mr. J. H. Fleming published his *Birds of Toronto, Canada*, in which he records *Spizella pusilla* as a summer resident, sometimes abundant.* We had found it abundant in 1921 and 1922 so its comparative scarcity in 1923 did not occasion great surprise and we confidently looked and listened for it again in 1924, but during the whole spring and summer season I saw only three at Toronto. In 1925, five birds were all that I observed and in 1926, three. In 1927 I saw not a single one. In 1928, on April 6 one was heard singing but it proved to be the only one of the season as far as my observations were concerned, and this spring (1929) I have heard but three.

My experience with this bird during the past nine years at Toronto has been by no means at variance with that of other observers and the very perplexing problem of "Why the Field Sparrow has become so scarce here"? remains unsolved.

The case of this bird seems to be an example of the pronounced periodic fluctuation in numbers which occurs with many species of birds at the limits of their range. This fluctuation may not be found as pronounced towards the centre of their abundance. If the species has become noticeably scarcer in other parts of Ontario within recent years it will be interesting to have the fact on record.—JAS. L. BAILLIE, JR.

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* *Auk*, Vol. XXIV, 1907, p. 81.

NOTES ON BIRD HOUSES.—Being a lover of birds I believe in having plenty of bird boxes around the house, at present I have six of these boxes erected at various places on the ranch and have three of them occupied by bluebirds. Among these is an eight-roomed house which I built for the swallows as these birds were taking possession of most of my bluebird boxes. The first year this house was erected I had three pairs of Violet-green swallows in it and I thought that it was going to be a great success. The next spring, when the bluebirds returned they immediately took possession of the box and succeeded in driving the swallows away. They evidently found the box was not suited to their requirements so they finally deserted. Since then I have never had any birds in it at all. The old box, which is now becoming warped and weather-beaten is used only as a drum for the flickers.

I also erected a box with two compartments, and for the past four years I have had a pair of bluebirds in one of the sections but the other half has remained empty, so I have decided that it is a waste of time and lumber to build more than a single compartment house, except for purple martins but there are none of these in this locality.—HERBERT M. SIMPSON, Box 2, West Summerland, B.C. July, 1929.

JAPANESE STARLINGS AT ALERT BAY.—Miss Moorehead, of London, a nurse who has spent parts of 1927 and 1928 at Alert Bay, B.C., off the northern coast of Vancouver Island tells me that the Japanese Starling is very abundant at that place. This indicates a very rapid spread northward, possibly because of the similarity of the climate of the British Columbia coast to that of the native habitat of this bird.—W. E. SAUNDERS.

BOOK REVIEW

THE FUNGI OF MANITOBA *by G. R. Bisby, A. H. Reginald Buller and John Dearness, with a preface by E. J. Butler, F.R.S., Director, Imperial Bureau of Mycology. 8 vo. 194 pages, publ.: Longmans, Green and Co., London, New York, Toronto. 1929. 7/6 net.*

In the preface to this useful and instructive volume we find Dr. Butler expresses himself as follows: "It would have been easy to select someone better fitted to do so [write the Preface] from familiarity with the subject, but not so easy to find one more sincerely convinced of its importance . . . . ". The authors are to be congratulated on having produced a handy and fascinating little book. With its importance I am equally impressed, for although there exist in Canada several more or less readily obtainable regional lists of fungi, this book covers one region, viz: Manitoba, extensively and admirably. The reader is impressed by the wealth of information about many of the fungi dealt with, just as was to be expected from the three distinguished authors. Nearly 2000 species and varieties, among them 45 new species and 2 new varieties are here recorded from the region covered. It is by no means merely a list of fungi, the treatise discusses the natural features of the province, the geographical distribution of fungi therein, their immigration and ecology, together with an interesting section on the history of observation on the fungi of Manitoba.

A chapter on the lichens of the region has been prepared by Kirk Scott Wright which will be found most useful. The care which the authors have taken in determining their collections or having their determinations confirmed by specialists is particularly worthy of praise.

Not the least interesting and valuable are the indices; these deal with the hosts or substrata of caulicolous and lignicolous fungi, of parasitic fungi affecting cultivated and wild plants, etc. The bibliography will also be found most useful.

The book sells at a very reasonable price and may be obtained in Canada from Prof. V. W. Jackson, Manitoba Agricultural College, Winnipeg.—H. T. GÜSSOW.

A copy of "The Natural History of the Double-crested Cormorant" by Dr. Harrison F. Lewis has been received and will be reviewed, it is expected, in the February issue. The volume, of one hundred pages, sells for seventy-five cents and may be obtained on application to H. C. Miller, 175 Nepean Street, Ottawa, Canada.

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1929-30

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Musk-ox Herd
Rounded up to resist attack

Musk-ox
Cape Sparbo, North Devon Island
August 1, 1929

The Canadian Field-Naturalist

VOL. XLIV OTTAWA, CANADA, FEBRUARY, 1930 No. 2

SOME ZOOLOGICAL ASPECTS OF THE CANADIAN ARCTIC EXPEDITION OF 1929

By P. A. TAVERNER

THROUGH the courtesy of the Northwest Territories and Yukon Branch of the Department of the Interior, under whose auspices the annual Arctic expedition to relieve and supply the northern police posts is made, the writer as representative of the National Museum of Canada, was enabled to visit a most interesting and, ornithologically, comparatively little-known territory.

Leaving North Sydney, Nova Scotia, on the S.S. *Beothic*, we made the Straits of Belle Isle to Godhavn, Greenland; thence across north Baffin Bay to the Arctic islands and north to the shores of Buchanan Bay, Kane Basin, latitude about 78°45′ N. From here we worked south along eastern coasts of the islands to Port Burwell off the north tip of Labrador, with a side excursion through Hudson Straits to Chesterfield Inlet, Hudson Bay. We returned to North Sydney September 4. En route stops were also made at Etah and Robertson Bay, north Greenland; Craig Harbour, southern Ellsemere Island; Cape Sparbo and Dundas Harbour, North Devon Island; Ponds Inlet, Clyde River, Pangnirtung and Lake Harbour, Baffin Island; Coats Island, Hudson Bay and Acadia Cove, Resolution Island. None of these stops was long enough for detailed local investigation. It was an unusually good season for voyaging in the eastern Arctic and in these uncertain seas the necessity of getting out of as well as into port while conditions were favourable precluded more than a brief reconnaissance at the various landings. However a rapid generalized trip over a large unfamiliar area may give a better view of the whole than can be gained by more intensive work on fragmentary parts of it. Such proved to be so in this case and the generalized concept of the eastern Arctic as a whole so gained will be of great assistance in evaluating the work of the past or planning that of the future. In spite of the exigencies and limiting requirements of the primary purposes of the expedition, a goodly number of specimens were taken, building up series in which the Museum was more or less weak or adding data on species of particular interest or about which questions have recently been raised. Though the collections made are eminently satisfactory, not much in detail can be said of them until they have been more carefully studied in relation to the individual problems involved.

Much might be said of the varied interests of the trip. The opalescent colours of the icebergs twisted into fantastic shapes by the magic of mirage, the wonderful greens and golds of the Greenland coast, the forbidding rockbound shores, the midnight sun, the Eskimos with komatik and kayak. But all these have been told before and worthy pens and cunning brushes have failed to represent more than dimly the actuality. Though these are without the special field of the ornithologist it must not be thought they passed unnoticed or unappreciated. They are among the most valued memories of the trip and no account of that trip is adequate without at least a mention of them.

Probably the most generally distributed and conspicuous bird was the Fulmar. These powerful fliers were seen constantly all over Baffin Bay and Davis Strait and into Lancaster and Jones Sounds as far as we penetrated, but were not seen in or known to enter Husdon Straits, an interesting restriction in the range of a very widely spread species. Strongly beating about back and forth or sailing with tight torpedo-shaped body or horizontal, stiffly held, pointed wings they speed with bullet-like decision over all the sea gleaning from its productivity. Close to the surface they follow, up one side of a wave and down the other, disappearing from view between and just topping the crest. On the turns they bank in great smooth curves with one wing seeming to skim the water, though try as we might with powerful glasses we never could see a ripple to denote actual contact. In calm or storm it is the same. No matter how the gale may blow or the seas rise there is the same easy mastery of the elements, in fact the turmoil seems but to add to their joy of life. Occasionally very dark birds, quite as dark as the dark phase of Fulmar common on the Pacific coast were observed but the ratio as compared to the light ones was about one in a hundred and at irregular intervals of

the voyage they seemed practically absent. Breeding colonies were reported near Coutts Inlet and off Cape Searle, eastern Baffin Island. At one of these stations they were said to be preyed upon so heavily by White Gyrfalcons that the shore ice was covered with their wings and remains.

Glaucous Gulls or "Burgomasters" in few but fairly constant numbers were generally distributed and some almost solitary nestings were observed here and there, usually on almost inaccessible cliffs, and communal nestings were reported. The species was numerous at Etah and Robertson Bay where they probably prey on the immense hordes of Dovekies that nest in the loose soil and rock piles of the shore hills. Of six of these Dovekies shot at Etah, four were seized upon and carried off by these gulls before they could be retrieved by the collector. A sharp look-out was kept for the Iceland Gull but, in spite of the general impression of its commonness in summer on these waters, no white-winged gull that could be referred to this species was seen. The probability of the Iceland Gull breeding in the American Arctic grows less as the evidence is sifted.

The wonder of all observers to the northern parts of Baffin Bay is the immense numbers of Dovekies or Little Auks. Words like "immense", "enormous" "innumerable", "incredible" are trite adjectives that familiar use has robbed of force but no weaker words express the condition. In calm weather one steams for hours through miles of sea blotched or clouded with aggregating bunches of these little surviving relatives of the extinct Great Auk, while flocks like hurrying clouds of mosquitoes constantly speed across the course going to or returning from the feeding grounds. They are not known to nest in the American Arctic but do so in wonderfully populous rookeries on the northwest Greenland coast. At Etah and Robertson Bay the hills rising abruptly from the harbour are largely loose talus piles of broken rock scantily overlaid or intermixed with peat-like mossy humus. This soft, readily excavated subsoil is easily cleared out from the maze of cavities and passages between the rocks, and the surface of the hills for many acres along the hill face is honeycombed and porous with Dovekies' nesting burrows. With white shirt fronts and black jackets and hoods the little birds perch in stiff and proper upright attitudes on every little point of vantage before their burrows. In certain lights and positions their white underbodies all showing seem to frost the knolls with a silvery sheen. Flocks are continually coming or going or wheeling out over the bay, their many wings making a continuous dull roar while the thin, short, piping voices sound absurdly like the chorus that comes from an enormous pond of "spring peepers" in mating season. The flocks skim close to the hillside projections on the landward wheel of their circlings and passings and the observer on salient points of the hillside is intermittently enveloped in a cloud of hurtling bodies while the sound of their wing beats rises to deafening intensity. It is from such vantage points that the local Eskimos take thousands for food in hand-nets. One Dovekie is only a tooth-full but, like peas, many make a meal, yet their myriads seem undiminished.

Kittiwakes were locally common and, though a few were noted occasionally far at sea, abundance usually made us suspect a gullery at no great distance.

Herring Gulls were decidedly not common. They evidently do not scatter their nestings in suitable locations all along the coast as they are inclined to do on the Gulf of St. Lawrence and that we did not touch at any nesting metropolis is probably the reason for their apparent scarcity. Birds taken at Dundas Harbour are of the northern, pale or restricted wing-tipped *thayeri* race while those observed south of Ponds Inlet appeared to be the common *argentatus* form that we get commonly on the Atlantic coast.

In the neighbourhood of their loomeries, Brünnich's Murre were very common and showed partiality for the neighbourhood of open floe ice. In the middle of Hudson Strait off Cape Wolstenholme numbers were seen swimming accompanied by their still half downy young again demonstrating that this group of birds betake themselves to sea with their offspring before the latter are more than half fledged. Seeing Brünnich's Murre for the first time in full plumage in life it was of interest to detect field marks by which it can be separated from its almost similar relative the Common Murre. Swimming in the water or flying by, the sharper angle of the white underparts into the black throat is rarely evident and the pale cutting edge of the upper mandible at the gape can be made out only under the most favourable circumstances. All things taken into consideration the obviously blacker head and neck seems to be the best guide to the recognition of the species in the field.

A few Jaegers, the Long-tailed, Parasitic and Pomarine were seen at various times. Their principal occupation seems to be robbing the gulls of their hard-earned provender. They are called "Jaegers" or "Hunters" but "Robbers" would be a much more descriptive title for they rarely hunt when they can despoil others of the fruits of the chase.

A comparative absence or rarity of waders or shore birds is some little surprise until one considered that the high, bold, shoreless coast of these eastern Arctic islands is no place for shore birds except such rock or surf-loving species as Purple

Sandpipers and Turnstones. On the occasional flats in coastal nooks in front of the backing hills where we happened to visit, Baird's Sandpiper seemed thoroughly at home and evidently, from their solicitude, nesting. Undoubtedly on the ridges between or in the neighbourhood of the tundra pools back from the shore other waders will be or have been found nesting but it is evident that the great wader highway of migration into the northern islands is up the low western side of Baffin Island rather than along the high forbidding eastern coast. This was more or less confirmed by our observation at Chesterfield Inlet where were met in numbers most of the wader species that we have failed to observe eastward. Enormous numbers of these visit the Atlantic coast and inland in migration and seasonally disappear into or reappear from the mysterious north. Their comparative absence from the Labrador coast and eastern Arctic islands and their appearance at Chesterfield and also west Baffin Island as reported by Mr. Soper, suggests strongly that the main highway of the Atlantic tbirds is across country to Hudson Bay and up into rhe heart of the Arctic Archipelago by an interior rather than an exterior route.

The most spectacular sight of the trip however was not ornithological but mammalogical,—the Musk Oxen at Cape Sparbo, North Devon Island. Thanks largely to explorers living off the "Friendly Arctic" the originally quite considerable herds of Musk Oxen have been sadly reduced within the past generation. However, if this Cape Sparbo herd is any criterion, the North Devon herd is coming back as rapidly as could be expected in the land of slow growth and limited resources and, if the present protective policy of the Canadian administration can be enforced, may regain its pristine number again. We found at Cape Sparbo bunches of seven and eleven and others to make up about twenty head of which a considerable number were calves which argues well for the natural increase. The Mounted Police who are watching them closely report others in the neighbourhood. At a distance and even at close range, with their long hairy locks draped to the ground about them they looked more like old hay-cocks, if such were possible in the Arctic, or erratic brown boulders on the little coastal flat where we found them, than like living animals. If we had not been looking closely in expectation of them they would probably have escaped observation, even then it took motion to differentiate them from natural objects about and to confirm recognition. On first sight of us they galloped off but the loosing of a couple of dogs was enough to cause them to pause on the first knoll and bunch, heads out, tails in and the calves squeezed within as far as possible. The dogs though of husky breed were only pups, had never hunted, took no more interest in the animals than to enjoy a race with them and turned away to more interesting matters when the game seemed over. However they were too much like their hereditary enemies, the wolves, to be disregarded or trusted by the Musk Oxen who held to their traditional formation to repel boarders and permitted us to approach as near as we desired without breaking. We might have killed the lot with a .22 pistol had we so desired, but instead did our shooting with cameras and scored a big bag of interest in game. They would threaten and shake their heads, brandishing their very business-like and sharp-tipped horns at us, nose their feet, snort ferociously and make feint at charging but it was evident their first care was to protect their rears. Every step forward from the bunch exposed an opening behind that they were most painfully aware of, and their demonstrations forward never went beyond a step or so and were immediately followed by a hasty retreat into formation again. We movied them and still-pictured them until film and plates were about spent and then as they were finally forced into a wild stampede the last of the film was run off at their scampering away over the tundra.

Numerous pods of Walrus were seen heaving their great shoulders out of the sea and exhibiting their yellow tusks in the northern part of Baffin Bay, and on the ice floes well south to Davis Strait a number of Polar Bears were observed. It is surprising how yellow and conspicuous these comparatively white animals show on the absolute whiteness of the ice, especially how far their black noses and eyes can be seen. The Eskimos say that in stalking seal the bear hides his nose behind his paw or pushes a snow block in front of it. To fully capitalize its camouflage it should close its eyes as well, but of this report does not tell, and probably the bear does not see things that way at all.

NOTES ON THE NORTHERN SCORPION, VAEJOVIS BOREUS GIRARD, IN BRITISH COLUMBIA

By T. B. KURATA
Royal Ontario Museum of Zoology, Toronto

DURING the summer of 1928 the writer had the opportunity of collecting specimens of the small northern scorpion, *Vaejovis boreus* Girard, in southern British Columbia and made a few observations upon its habits which may be worth recording.

Vaejovis boreus is widely distributed in the western United States and ranges northward into the drier parts of southern British Columbia and Alberta. Ewing ('28)[1] records it from Arizona, Nebraska, Oregon, Idaho, Wyoming, Montana, South Dakota, and North Dakota ("Bad Lands"), and Essig ('26)[2] lists it also from California, Nevada, Utah and Washington

The earliest record of scorpions in Canada is that of Anderson ('01)[3], who found them at Keremeos, in the Okanagan district of British Columbia. The species is not named but was doubtless the same as ours, no other species being found nearly so far north. It has also been reported from the vicinity of Medicine Hat, Alberta by Chamberlain ('24)[4]. To these may be added the following Canadian records:—

Little Sandhill Creek, Red Deer, Alberta; 1 specimen collected by C. M. Sternberg (Royal Ontario Museum of Zoology).

Near Iddlesleigh, Red Deer River, Alberta; Aug. 25, 1919; 1 specimen, V. R. Summerhayes (Royal Ontario Museum of Zoology).

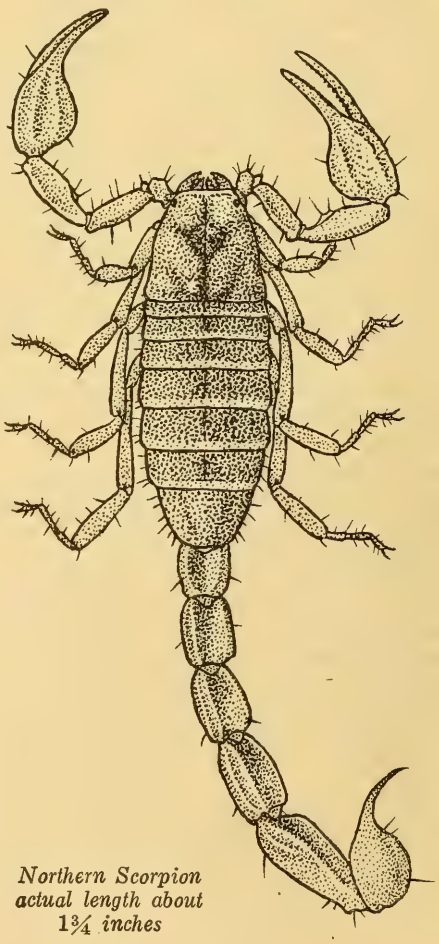
Medicine Hat, Alberta; 2 large and 1 small specimen, Miss J. M. Gondie (National Collection, Ottawa).

Turner Valley, 35 miles southwest of Calgary, Alberta, 1925; Dr. George Hume.

Summerland, B.C., July 3–24, 1928, numerous specimens, T. B. Kurata and E. B. S. Logier.

On June 29th, in company with Professor J. R. Dymond and C. Mottley of the Department of Zoology, University of Toronto, and Mr. E. B. S. Logier of the Royal Ontario Museum of Zoology, I arrived at Summerland, which is on the west side of Okanagan Lake, about ten miles from its southern end. Here we had the good fortune to have the assistance of Mr. George N. Gartrell in our natural history work, and through his guidance we were able to accomplish far more than we could otherwise have done in the time at our disposal. One of the first inquiries we made of Mr. Gartrell was "Are there any scorpions around here?" He assured us that there were, so next day Mr. Logier and I started out to search for them. Under Mr. Gartrell's guidance we soon located our quarry.

Along this part of the lake clay cliffs a hundred or more feet in height arise abruptly almost from the water's edge, and near the foot of these cliffs is a sort of talus slope. At first we hunted in crevices on the upright wall of the cliff and soon



Northern Scorpion actual length about 1¾ inches

[1]Ewing, H. E. The Scorpions of the Western Part of the United States, with Notes on those occurring in Northern Mexico. Proc. U.S. Nat. Mus. 73: 1–24, with pls. 1, 2. Art. 2730, 1928.

[2]Essig, E. O. Insects of Western North America, p. 10, fig. 6.

[3]Anderson, J. R. Rattlesnakes and Scorpions. Ottawa Nat. 15: 162–163.

[4]Chamberlin, R. V. The Northern Range of the Scorpion. Science, 59: 64.

secured a dozen specimens. On exhausting this hunting place we searched among the broken materials at the foot of the cliff, where we found about an equal number. They were not confined to these clay banks, however, for I later found one in an empty rattlesnake den on a rock slide nearly three hundred feet from the foot of a hill at Keremeos.

Collecting was done by night as well as by day. From my experience at that time, confirmed by observations on captive specimens since, I believe them to be more active by night than by day.

Their food appears to consist of soft-bodied insects of various kinds. On one occasion when hunting them by night with the aid of a flashlight, I saw one feeding on a beetle and another on a mayfly. Remains of other insects and spiders were also found in the crevices of the clay cliff occupied by scorpions.

In capturing its prey the scorpion lies motionless in its retreat, almost wholly hidden, except for the claws and eyes and a portion of the head. Here it waits until the prey approaches near enough to be seized without much exertion. From observations on captive specimens I believe that these scorpions do not pursue their prey but lie in wait for it as described above.

When the prey is within easy reach the scorpion springs at it and seizes it with a pair of claws. If it fails to get a firm hold on the insect at first, another claw is brought into action, and these movements may be repeated several times. Then, with the prey firmly held, the scorpion throws its postabdomen, at the end of which the sting is situated, swiftly forward with considerable force, striking its prey with much precision, between the head and thorax, thus poisoning it. The prey is then eaten voraciously. When the prey is not of formidable size the poisoning may be omitted. I believe the prey is never attacked in open spaces nor is the scorpion attracted by motionless objects.

One specimen, captured on the 10th of July, was kept in an empty tobacco tin until October. It was fed with grasshoppers, crickets, houseflies, mayflies, beetles and spiders. Of these it seemed to prefer the houseflies, spiders and grasshoppers.

About the middle of October I transferred it to larger quarters, a glass cage, 10″ x 7″ x 10″, the bottom of which was covered with four inches of sandy soil. On the surface of the soil I placed a few pieces of bark as a hiding place. A few days later I discovered the scorpion digging under the bark. This was accomplished by jerky backward movements of all the legs, except the last pair, which were used to support the body. It worked each side alternately, never

Habitat of Northern Scorpion at Summerland, B.C.

[Photo by C. PEEL NELSON

together, throwing the loose sand backward until a large enough space was excavated for a retreat.

A real problem presented itself at the autumn approached and insects began to disappear. Fortunately, however, there is an abundance of silverfish (*Thermobia domestica*) in my laboratory at the Museum. I trapped a dozen of these and put them in the cage for a trial meal. I am glad to say the scorpion took them without hesitation.

As already mentioned, scorpions, according to my experience, do not pursue their prey. For this reason I was forced to put my specimen into smaller quarters so that its prey would be within reach.

Judging from my experience with the sting of this species of scorpion as well as with that of the large bird spider (*Avicularia* sp.) I would say that the scorpion's sting is hardly more painful than that of the spider, yet it is a little more so than that of a hornet.

Regarding the distribution of *Vaejovis boreus* in British Columbia I believe they will be found to occur a few miles east of Kamloops, along the Canadian Pacific line, as the conditions there resemble those of the escarpment of Okanagan lake and the summer temperature is similar in the two localities.

THE JAPANESE STARLING AT ALERT BAY, BRITISH COLUMBIA

By J. A. MUNRO

ON page 24 of the current volume of *The Canadian Field-Naturalist*, Mr. W. E. Saunders, on the authority of Miss Moorhead of London, Ontario, records the Japanese Starling as very abundant at Alert Bay, British Columbia, in 1927 and 1928.

This introduced Mynah has occupied Vancouver and its environs for the past 30 years at least. During that time a great increase of the species has taken place but the centre of abundance has remained within the agricultural area adjoining the mouth of the Fraser River. The overflow from the original colony has worked east; New Westminster being the farthest point at which the species is, or has been, at all common and Chilliwack, 80 miles from Vancouver, the farthest outpost where single individuals have been observed.

That the species should suddenly appear in abundance nearly 200 miles from the parent colony, which has been in almost sedentary occupation of a limited area for over 30 years, is indeed remarkable. To the best of my knowledge none have been observed in the intervening territory, which contains agricultural areas suitable to the needs of the species. Had it appeared in the Nanaimo or Comox Districts, both of which are kept under observation by local ornithologists, the fact probably would have been noted and recorded. It was not observed at Alert Bay in the spring of 1926 when Major Allan Brooks visited that place.

Alert Bay, on Cormorant Island, is an Indian village built between the sea beach and the rough, dense forest which covers this island. There is no farm land in the vicinity and consequently no area suitable for colonization by the Japanese Starling.

In view of the above comments further information concerning this astonishing range extension would be desirable.

LATE SUMMER BIRD NOTES ALONG THE UPPER MICHIPICOTEN RIVER, ONTARIO

By WILLIAM G. FARGO and MILTON B. TRAUTMAN

MICHIPICOTEN RIVER entering Lake Superior at the northeast angle of the lake has its rise among lakes lying along the height of land dividing the watershed of the Great Lakes from that of Hudson Bay. The present notes cover an area about 24 miles in length from Missanabie on Dog Lake downstream into Whitefish Lake. Our stay in this region was from August 9th to August 27th, 1928; the major portion of this period being spent in camps on Lake Manitowik which is in north latitude 48°-10′ and west longitude 84°-20′. This is a beautiful sheet of clear water fifteen miles long flanked throughout by high rocky hills, in general forested with birch and spruce. In several places steep granitic cliffs rise from the water's edge.

At the foot of Lake Manitowik, both in Hawk

Bay and South Bay are sandy beaches, an unusual feature in this rocky region. Our main camp was at the sand beach of South Bay. Two considerable streams enter at the south end of the lake and here also is the outlet over Pigeon Falls, below which a short distance lies Whitefish Lake, some six miles long.

The year 1928 began with a rather cold and late spring, hence birds were breeding somewhat late and blackflies were numerous here until August 22nd after which due to cooler weather and rains these pests were seldom troublesome. The annexed tabulation shows in graphic form the relative numbers of different species of birds observed (98 in all) during the period of our stay.

The following notes pertain principally to evidences of breeding of certain species so observed with a few references to migration.

Pandion haliaetus carolinensis. OSPREY.—At the time of the senior author's visit to Lake Manitowik in August 1921 there was an Osprey's nest in use at the outlet of the lake. This nest at the top of a broken spruce was the usual large flat platform of sticks and two adult birds were about. In 1928 this tree was gone, but there was a nest to the west of Hawk Bay in a lone stub half way up a broad sloping hillside recently burned off and located more than a quarter mile from shore. An Osprey was seen to fly toward and settle upon this nest on August 17th. It appears to be a habit of Ospreys to remain in the immediate vicinity of their nests as long as they remain in the general region.

Nuttalornis borealis. OLIVE-SIDED FLYCATCHER.—From August 14th to 20th one or two families of this species were often seen, the young being fed by the parents near suitable breeding places, so it is probable they were nesting nearby.

Corvus corax europhilus. SOUTHEASTERN RAVEN.—Dr. H. C. Oberholser has identified the one specimen of Raven collected at Lake Manitowik as this form which he described in *Ohio Journal of Science,* (Columbus, Ohio) April 1918, page 215.

Loxia curvirostra minor. AMERICAN CROSSBILL.—Both species of Crossbills were common during our stay and the males in song. Considering both species, not over 20% of the crossbills seen were females. It is probable that the females were incubating or brooding. At this time of the year only the spruce cones at the tips of tall trees in full sun light were sufficiently ripe to attract the birds. The American Crossbill was slightly more numerous than the White-winged about Lake Manitowik. We did not happen to see any young of the American Crossbill.

Loxia leucoptera. WHITE-WINGED CROSSBILL.—On August 20th about 8:30 a.m. Mr. Trautman heard young birds calling in a spruce swamp and soon located the nest 41 feet up in a 12-in. spruce, 48 feet in total height. This nest was of fine twigs lined with Usnaea moss located in the crotch formed by a small lateral branch with the stem of the tree, here about 2 in. diameter. At this time it was somewhat flattened out by the young birds. On shaking the tree a nestling White-winged Crossbill fluttered down. It was well feathered and due to leave the nest in a day or so. This nest with three young found was collected and all are now deposited in the Ohio State Museum, Columbus, Ohio, which Mr. Trautman represents as a voluntary worker.

The bill of the largest only of these three nestlings showed any tendency toward a crossing of the mandibles, and this but slight. An examination of twenty specimens of the American Crossbill and of twenty-seven specimens of White-winged Crossbills at the Museum of Zoology at Ann Arbor failed to show any uniformity of direction of crossing of the mandibles. Both species and both sexes of each showed approximately as many bills crossing to the left as to the right.

The stomachs of these nestlings contained no food at nine in the morning. All three stomachs contained sand, the first containing 81 particles countable with the naked eye, having a total weight of .055 gram. The second, 91 particles weighing .045 gram, while the third contained 153 particles weighing .093 gram. The largest sand grains were from 0.5 to 1.0 mm. in size. The sand was about three-fourths quartz, the remainder being hornblende, a little feldspar and a trace of apatite.

It would be of interest to know whether Crossbill nestlings of the age indicated by their being about ready to leave the nest are fed on insects or their larvæ or whether upon predigested vegetable food and if the former food prevailed, how the sand reached their stomachs.

Spinus pinus. PINE SISKIN.—On August 27th young Pine Siskins were seen being fed along the shores of Dog Lake. Prior to this adults were common elsewhere in the region.

Passerherbulus lecontei. LECONTE'S SPARROW.—On August 24th a single specimen of this sparrow was seen and collected on a little marsh bordering a small lake located a half mile to the northwest of Lake Manitowik near the head of the latter. This specimen is deposited in the Museum of Zoology of the University of Michigan at Ann Arbor and is a male of the year. On the same day we dragged with rope the only other marshes near

x = Collected m = many c = Common f = few

	August, 1928	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	Total named forms observed 98	
1	Horned Grebe	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...		1
2	Pied-billed Grebe	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...		2
3	Loon	1	1	2	...	5	...	1	4	3	3	1	1	2	2	6	2	2	2	2	...		3
4	Herring Gull	f	f	...	...	...	...	...	...	...	1	...	3	...	...	5	1	...	1	1	1		4
5	Ring-billed Gull	2	2	...	...	...	...	...	1	...	...	1	...	3	1	2	...	...	...	2	...		5
6	Am. Merganser	...	...	...	...	...	...	...	...	...	10	1	...	11	...	...	...	...	...	...	...		6
7	Hooded Merganser	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...		7
8	Mallard	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...		8
9	Black Duck	...	...	2	6	...	...	2	2	...	...	1	1	1	...	...	2	1	2	9	1		9
10	xAm. Golden-eye	...	...	...	...	2	7	18	...	12	6	6	4	5	3	2	2	2	3	6	6		10
11	Great Blue Heron	...	...	...	...	...	1	1	...	...	...	...	...	1	...	3	1	1	...	...	1		11
12	Greater Yellow-legs	...	...	1	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...		12
13	Solitary Sandpiper	...	...	3	...	...	...	2	1	1	2	2	...	1	1	1	1	1	1	...	...		13
14	Spotted Sandpiper	2	f	f	f	3	1	1	...	2	1	2	2	2	2	3	2	2	2	2	...		14
15	xCanada Spruce Partridge	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...		15
16	xCanada Ruffed Grouse	1F	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...		16
17	xSharp-shinned Hawk	...	...	...	...	...	...	...	...	1	...	...	1	1	1	2	...	...	...	...	...		17
18	Cooper's Hawk	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...		18
19	Goshawk	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...		19
20	xRed-tailed Hawk	...	...	...	...	2	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...		20
21	Broad-winged Hawk	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...		21
22	Duck Hawk	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...		22
23	Pigeon Hawk	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		23
24	Sparrow Hawk	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...		24
25	Osprey	2	...	...	...	...	...	...	...	2	...	...	1	...	...	...	...	...	...	1	...		25
26	Great Gray Owl	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...		26
27	Saw-whet Owl	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...		27
28	xGreat Horned Owl	...	...	...	...	1	1	...	...	1	...	...	...	...	...	...	...	1	...	2	...		28
29	Belted Kingfisher	...	...	1	1	1	...	2	1	...	...	...	...	...	...	...	...	1	5	8	...		29
30	N. Hairy Woodpecker	1	1	1	1	2	1	1	...	...	1	...	...	...	1	1	1	1	1	2	...		30
31	Downy Woodpecker	2	10	...	...	...	1	...	...	...	...	...	...	...	...	...	1	2	1	...	...	...		31
32	xArctic 3-Toed Woodpecker	...	...	...	...	...	...	...	...	2	1	...	...	...	...	...	...	...	...	...	...		32
33	Yellow Bellied Sapsucker	c	c	c	f	1	...	...	1	...	1	...	...	...	1	...	...	...	...	...	...		33
34	N. Pileated Woodpecker	...	...	1	...	...	...	...	...	...	1	...	...	...	...	1	...	1	...	...	...		34
35	Northern Flicker	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	2	...		35
36	Whip-Poor-Will	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...		36
37	Nighthawk	cF	...	...	...	1	...	12	6	3	6	8	6	3	3	2	1	2	3	2	...		37
38	Chimney Swift	f	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		38
39	Hummingbird—Ruby-throated	...	...	2	2	3	2	1	1	1	3	2	2	...	6	...	...	...	...	...	...		39
40	Kingbird	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...		40
41	xPhoebe	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...		41
42	Olive-sided Flycatcher	...	...	...	...	...	7	5	12	3	8	5	4	1	1	...	...	...	...	...	...		42
43	xYellow-bellied Flycatcher	...	...	...	1	...	5	...	6	...	2	...	3	1	2	...	...	...	...	3	...		43
44	xLeast Flycatcher	...	...	3	3	2	c	c	c	c	c	c	c	15	c	...	...	...	...	...	...		44
45	Blue Jay	...	...	...	...	...	...	3	...	...	...	1	1	...	1	1	1	1	1	1	...		45
46	xCanada Jay	...	...	...	4	1	...	...	5	...	...	...	...	...	6	...	...	1	...	...	...		46
47	xNorthern Raven	...	...	...	...	...	1	...	...	...	...	...	...	1	...	1	1	...	...	...	...		47
48	Crow	f	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	2	...		48
49	xRusty Blackbird	...	...	...	...	...	2	...	7	10	7	5	2	...	1	...	...	...	...	10	...		49
50	Bronzed Grackle	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...		50
51	xPurple Finch	...	...	...	...	...	m	c	24	25	24	c	f	3	15	1	2	2	3	5	...		51
52	English Sparrow	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	f	...		52
53	xAmerican Crossbill	...	c	c	c	c	c	c	c	f	c	2	c	1	10	c	c	c	10	3	...		53
54	xWhite-winged Crossbill	...	c	c	c	f	c	c	c	c	f	2	c	2	6	c	5	c	2	1	...		54
55	American Goldfinch	c	...	...	...	3	2	...	...	...	2	...	...	1	2	...	...	...	...	...	...		55
56	xPine Siskin	...	...	1	6	...	c	c	c	c	c	c	c	...	25	10	10	10	5	10	3		56
57	Savannah Sparrow	c	...	...	...	...	...	...	f	...	...	...	...	...	...	...	...	...	...	...	...		57
58	xLeconte's Sparrow	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...		58
59	White-throated Sparrow	c	c	c	c	f	m	m	c	c	c	c	m	c	c	c	10	15	15	m	3		59
60	Slate Coloured Junco	f	f	c	c	c	...	c	c	c	c	c	m	m	c	2	4	3	3	c	c		60
61	xSong Sparrow	f	f	...	...	1	...	...	5	...	...	...	2	2	...	...	3	2	1	3	2		61
62	xSwamp Sparrow	...	...	...	c	...	m	c	c	c	c	c	c	10	...	...	5	3	...	...	...		62
63	Barn Swallow	...	f	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		63
64	Cedar Waxwing	m	m	...	...	c	c	c	c	c	c	c	c	c	c	c	3	1	3	5	c		64
65	Red-eyed Vireo	c	f	c	c	c	c	c	c	2	c	c	c	1	c	1	1	12	10	10	2		65
66	xPhiladelphia Vireo	...	...	...	...	...	...	...	...	...	2	...	3	...	6	1	...	10	3	10	2		66
67	Blue-headed Vireo	...	1	...	...	...	...	3	2	...	1	1	...	...	1	...	...	...	...	...	...		67
68	Black and White Warbler	...	...	f	f	...	1	1	5	1	1	1	...	...	1	...	...	1	1	2	...		68
69	Nashville Warbler	3	c	c	3	...	2	8	10	c	5	2	2	...	3	2	...	...	...	...	...		69
70	Tennessee Warbler	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	2	...		70
71	Cape May Warbler	...	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		71
72	Yellow Warbler	3	...	...	...	...	...	...	1	1	...	...	...	...	...	1	...	...	...	...	...		72
73	Black-throated Blue Warbler	...	3	4	1	1	...	...	2	...	...	1	...	...	...	1	...	...	...	1	...		73
74	xMyrtle Warbler	...	...	c	...	1	...	f	10	...	f	3	...	m	m	10	2	...	3	1	10		74
75	Magnolia Warbler	2	c	f	...	...	1	...	2	...	...	c	c	2	10	...	...	3	2	2	...		75
76	Bay-breasted Warbler	...	...	f	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...		76
77	Black-poll Warbler	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...		77
78	Blackburnian Warbler	...	1	f	...	...	...	...	6	...	...	1	...	...	1	...	...	...	...	...	...		78
79	xBlack-throated Green Warbler	...	1	c	c	...	...	1	2	...	m	1	...	...	12	1	1	12	5	2	...		79
80	Pine Warbler	...	...	...	...	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	...		80
81	Palm Warbler	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...		81
82	Oven-bird	...	...	f	1	...	...	...	...	...	...	4	...	1	...	...	1	...	1	2	...		82
83	xWater-thrush	1	f	f	f	f	...	c	c	f	f	f	1	3	3	1	1	1	2	8	...		83
84	Mourning Warbler	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...		84
85	Wilson Warbler	...	1	...	...	2	...	...	5	...	5	...	1	1	1	1	...	...	...	3	...		85
86	Canadian Warbler	5	1	f	f	...	...	c	c	f	3	3	5	1	3	1	...	...	...	10	...		86
87	American Redstart	...	2	3	1	...	2	...	7	f	2	...	...	2	5	3	...	...	2	15	...		87
88	Winter Wren	2	1	...	...	...	1	...	...	...	1	1	1	1	2	...	...	...	...	...	1		88
89	Brown Creeper	...	...	2	...	...	...	...	1	...	4	...	...	...	1	...	...	2	...	...	...		89
90	Red-breasted Nuthatch	...	...	c	c	c	1	...	5	2	2	1	1	2	4	1	1	2	2	3	...		90
91	xBlack-capped Chickadee	m	m	m	m	c	1	c	c	c	c	f	f	f	10	30	10	10	15	10	5		91
92	xHudsonian Chickadee	...	f	f	6	...	15	c	20	m	m	f	c	c	m	m	5	5	10	2	...		92
93	Golden-crowned Kinglet	...	...	c	c	c	4	c	m	m	c	c	c	c	c	3	m	mm	mm	m	10		93
94	Ruby-crowned Kinglet	...	...	...	...	...	...	...	1	1	...	...	...	12	...	...	...	...	...	...	...		94
95	Gray-cheeked Thrush	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...		95
96	xOlive-backed Thrush	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	c	...	...	...		96
97	xHermit Thrush	...	...	...	...	1	f	f	...	1	f	3	c	2	7	3	7	5	...	...	...		97
98	Robin	6	f	f	1	2	c	c	c	f	f	f	3	1	12	1	...	...	...	...	10		98

Items in Column 9 marked with subscript F, also Col. 28 were observed at Franz.

that end of Lake Manitowik without finding any more birds of this species. This location is some 200 miles eastward of the point where Walter N. Koelz collected a single specimen July 27, 1922 as reported in *The Canadian Field-Naturalist* of 1923, page 118.

Melospiza melodia melodia. SONG SPARROW.—This species was occasionally seen throughout our stay, but nowhere was it common for the habitat in general is not to its liking. On August 9th at Franz a nest with well feathered young was found in a bush three feet above ground near the bank of the lake. The nest was discovered by noticing the parents carrying food.

Dendroica caerulescens caerulescens. BLACK-THROATED BLUE WARBLER.—This species was seen occasionally and on August 16th parents were seen feeding young in a jackpine forest.

Dendroica virens. BLACK-THROATED GREEN WARBLER.—This species was more common than the last and on August 18th young birds were seen being fed.

Dendroica vigorsi vigorsi. PINE WARBLER.—On August 16th in the jackpine forest bordering the little river entering South Bay of Lake Manitowik were seen the parents of this species feeding young not long from the nest. Others of the species were heard here, but all had left the locality on the 21st. This is well to the north of the published range and we regret that none were collected.

Setophaga ruticilla. REDSTART.—This species was seen in small numbers during our stay and on August 27th was plentiful in migration, at which time young were seen being still fed by the parents.

Penthestes hudsonicus hudsonicus. HUDSONIAN CHICKADEE.—From August 10th for about two weeks Hudsonian Chickadees were common, the young birds were with the adults but beginning to shift for themselves. Both young and old were in nearly complete molt. Toward the end of the month they were much less common and it is probable that they had completed their molt and moved southward.

In 1926 while the senior author was located some 70 miles further south (Agawa Bay) no Hudsonian Chickadees were seen until August 29th at which time the molt was practically completed. See *Canadian Field-Naturalist*, Vol XLI, No. 1, page 7. (January, 1927).

In the Lake Manitowik region during the middle of August the only thrushes seen were Hermit Thrushes, *Hylocichla guttata pallasi* which were commonly seen feeding young too small to have flown from any distance. Between August 22-25, Olive-backed Thrushes, *Hylocichla ustulata swainsoni* and Gray-cheeked Thrushes, *Hylocichla aliciae aliciae* appeared as migrants.

The accompanying tabulation exhibits a daily record of the birds observed along the Upper Michipicoten River by the authors from August 9th to 28th, 1928.

SOME INTRODUCED MOLLUSCS

By F. R. LATCHFORD

Helix nemoralis Linn.—By a round-about route, there reached me recently a full-grown living specimen of this foreign mollusc, which had been collected climbing a raspberry cane in a garden at Owen Sound. So far as I am aware, it is the first of the species ever found in this province. The collector was Mr. Arthur E. Rankin, who sent it to Mr. J. Roland Brown, the well known naturalist of Hamilton, who sent it to me about two months after its capture. The apicial whorls are bright yellow in color, beautifully banded, while the body is of a rich brown and dark lipped.

In my note on "Land and Fluviatile Shells of Anticosti", published in the American Naturalist for October, 1884, I recorded it under the name *hortensis*, then commonly applied to the pale-lipped variety of *nemoralis*, as among the molluscs on that lone island collected in the previous year by my friend, the late distinguished field-naturalist, John Macoun.

The shell had long been known to occur along the lower St. Lawrence from Quebec to Gaspé, and in the coastal region of Maine and Massachusetts. A large introduced colony exists in the interior of Virginia, from which I have many specimens, a few yellow "selfs", but nearly all zoned with dark lines of varying widths.

In my cabinet, from Wood's Hole, Mass., is the small, pale greenish form which Dr. Binney thought distinct and named *sub-globosa*. It is, however, merely a variety.

H. nemoralis is widely distributed in western Europe. It does not burrow like our native helices, but is a surface feeder and a climber. The latter habit and its brilliant coloring render it easily visible to its principal enemies, the birds of the thrush family. However great its numbers, it does little injury in gardens and is not likely to become a pest anywhere in Canada. My specimen seems to thrive on a lettuce diet, but may feel lonely for lack of company.

Lymnaea auricularia Linn.—Two living specimens of this European pond snail were found alive on Nov. 3, 1929, at Sunnyside, in the west end of Toronto. The species was not previously known to occur in Canada though it had been noticed in the United States in more than one public park, where it had probably been introduced on aquatic plants. The shells found are not distinguishable in any respect from specimens in my cabinet received from the late W. C. Hey, of York, England.

Valvata piscinalis Mull.—In 1912, near where *L. auricularia* was found early in the present month, I found quite a number of living specimens of a small shell which was unknown to me and unassignable to any species described in any list of American molluscs which I possessed. I sent specimens to my old-time correspondent and friend, Dr. Bryant Walker, of Detroit, who identified them as of this European species which had not previously been noticed in America. I have seen no mention since of its occurrence elsewhere. The original beach at Sunnyside has long been destroyed by the improvements to the harbor; and the unique occurrence may be worthy of wider publicity that it received in "The Natural History of the Toronto Region", published by The Canadian Institute in 1913.

The mollusc is larger and more conical than our common *V. sincera* and *V. tricarinata*, and more nearly resembles, if the lines of the operculum are disregarded, an overgrown *amnicola*.

V. piscinalis is mentioned in the Canadian Journal of National Science, Vol. vi., 1861, p. 328, as having been found in the environs of Toronto by A. E. Williamson, and, p. 498, in pleistocene deposits near Owen Sound by Professor Chapman. Identification of the shells was difficult at the time and both were undoubtedly *V. sincera*, an indigenous species commonly met with in accumulations of marl.

Osgoode Hall, Toronto, Nov. 12, 1929.

CHRISTMAS BIRD CENSUS, 1929

LONDON, ONTARIO, December 28th, 1929.—It had been the intention of the McIlwraith Ornithological Club to take their Christmas Census on Saturday, Dec. 21st, but the weather conditions of the preceeding week, when blizzard conditions prevailed, induced us to put it off for one week as it was thought that the number of birds found would not fairly represent those actually present.

The following Saturday, the 28th, saw better temperatures, but in the meantime a thaw had set in which made walking cross country a laborious effort, and travel by automobile, except on the main highways, almost impossible.

A company of eighteen observers were divided into thirteen parties, some working in the morning, others in the afternoon, practically from daylight until dark. The districts surrounding the city north, south, east and west were all visited, particular attention being paid to the Thames valley west from the city. Some parties reported as many as 18 or 19 species while others, covering what is usually good territory, had to return with only 4 or 5. One species, the Chickadee, was seen by every one of the thirteen parties.

Temperature 34° at 8 a.m., 34° at 1 p.m. 30° at 7 p.m. Wind, south-west, light. About one foot of snow on the level, wet owing to the recent thaw. Sky overcast except for about one hour during the afternoon, light and visibility poor in the early morning and again towards evening.

Herring Gull 6. American Merganser 25. Black Duck 11. American Goldeneye 36. Wilson's Snipe 1 at a place where the ground was kept open by a spring. Quail 8, a covey of seven and a single bird. Grouse 1, and tracks of another at a different place. Pheasant 25. Cooper's Hawk 1. Red-tailed Hawk 1, two others shot recently. Long-eared Owl 1. Screech Owl 5. Great-horned Owl 2. Kingfisher 3. Hairy Woodpecker 12. Downy Woodpecker 35. Sapsucker (?) 1, got away before it could be positively identified. Flicker 1. Blue Jay 54. Crow 359. Starling 153, many at a dump but generally distributed as well. Meadowlark 1, at the dump with the starlings, etc. Bronzed Grackle 1, at the same dump. (The red tail was at this dump, too, by the way). Pine Grosbeak 51, down from the north this year in good numbers and generally distributed. The first visitation of any account since the winter of 1921-1922. Purple Finch 8. Goldfinch 28. Pine Siskin 20. Snow Bunting 233, quite common this winter. English Sparrow, hundreds. Tree Sparrow 71. Junco 33. Song Sparrow 2. Cardinal 31, this species is increasing splendidly. Northern Shrike 1. Brown Creeper 2. White-breasted Nuthatch 48. Black-capped Chickadee 160. Golden-crowned Kinglet 7.

Total, 38 species, 1438 individuals, plus English Sparrows.

Also seen recently but missed on the census,

Marsh Hawk, Red-shouldered Hawk, Catbird (Dec. 11th).

It is now twenty years since our club made their first census report, a start being made in 1910 when four observers sent in a list of seven species. The number of both observers and species reported has increased materially since then and the end is not yet, we hope.—E. M. S. DALE, Secretary, *McIlwraith Ornithological Club.*

SUMMERLAND, OKANAGAN LAKE, BRITISH COLUMBIA, December 22nd, 1929.—From 8.30 a.m. to 3.30 p.m. Very strong south wind. Cloudy, with snow in the air in the morning; depth of snow, from 4 inches to 15 inches. Average temperature 38 degrees. Along four miles of lakefront and adjoining fruit-benches, back to pine-clad hills. Area covered, about ten square miles. Observers separate.

Herring Gull 4, American Golden-eye 2, Bufflehead 3, Canada Goose 5, Wilson's Snipe 2, Killdeer 3, Pheasant 107, Hungarian Partridge 6, California Quail 355, Goshawk 1, Pigeon Hawk 2, Bald Eagle 1, Hairy Woodpecker 4, Batchelder's Woodpecker 2, Red-shafted Flicker 44, Magpie 51, Clarke's Nutcracker 1, Red-winged Blackbird 50, Brewer's Blackbird 3, Evening Grosbeak 42, Pine Grosbeak 25, Redpoll 1120, Goldfinch 195, Pine Siskin 550, Snow Bunting 1, Tree Sparrow 2, Schufeldt's Junco 650, Song Sparrow 49, Towhee 1, Bohemian Waxwing 870, Northern Shrike 2, Dipper 2, Slender-billed Nuthatch 4, Red-breasted Nuthatch 1, Pigmy Nuthatch 5, Long-tailed Chickadee 81, Mountain Chickadee 20, Golden-crowned Kinglet 1.

Total species 39. Total individuals 4,365. Also fifty English Sparrows.—S. A. LIDDELL, E. M. TAIT AND H. M. SIMPSON.

VINELAND, ONTARIO, December 28th, 1929.—4 observers in the field from 8.30 a.m. to 12.30 p.m., visiting by automobile various types of country, including lake shore, marsh, fields, and woods. Weather overcast and misty, temperature 33°, considerable soft snow on the ground. Herring Gull 1, English Ring-necked Pheasants 7, Sparrow Hawk 1, Hairy Woodpecker 1, Downy Woodpecker 3, Flicker 2, Blue Jay 1, Crow 2, English Sparrow, Golden Finch 1, Tree Sparrow 38, Junco 20, Song Sparrow 2, White-breasted Nuthatch 4, Black-capped Chickadee 30. Total 15 species, 113 individuals, plus English Sparrows.—G. H. DICKSON, W. J. K. HARKNESS, W. E. HURLBURT, E. F. PALMER.

CHAMBLY, QUEBEC, (near Montreal), December 22nd, 1929.—10 a.m. to 4.20 p.m., clear, nearly two feet of snow in woods, temperature zero, 10 miles on foot, observers together.

Merganser (species ?) 3, Ruffed Grouse 4 (tracks of about twelve noted), Hairy Woodpecker 1, Downy Woodpecker 1, Starling 75, Pine Grosbeak 1, Redpoll 20, Snow Bunting 7, White-breasted Nuthatch 1, Red-breasted Nuthatch 4, Black-capped Chickadee 65 (well distributed). Chickadees were exceptionally well distributed. Throughout the day we were nearly always within hearing of their calls; the Starlings, on the other hand, were all seen in one group, feeding about a refuse heap.

Total 11 species, 182 individuals.—H. A. C. JACKSON, R. A. OUTHET, L. M. TERRILL (*Province of Quebec Society for the Protection of Birds*).

CAPE DORSET, BAFFIN ISLAND, N.W.T., December 27th, 1928.—9.30 a.m. to 2.15 p.m. Accompanied by Henry Voisey, interpreter of the Hudson's Bay Company from Dorset Post for about ten miles on snowshoes down the east coast of Dorset Island, along the base of the Kingnait Range to the west and then over the mountains at an altitude of 1000 feet to the coast at Kepata Strait; the return was made through "The Gap" (800′) on the east flank of Cairn Mountain to the post. Region treeless, and most of the lowly Arctic vegetation covered with snow varying in depth from a few inches to several feet. Observers together. Weather clear and calm; temperature 8° to 2°F.

Birds observed: 1 Northern Raven.

Tracks of Rock Ptarmigan noted on the side of the Kingnait Range at 750 feet. During the week, the Eskimos reported the presence of Mandt's Guillemot and the Northern Eider at the floe-edge south of Cape Dorset. Recorded temperatures for this period varied from −20° to 17°F.—J. DEWEY SOPER.

PAKENHAM, ONTARIO, December 24th, 1929.—9 a.m. to 12 a.m., 1.15 p.m. to 4.15 p.m. Fair, bright, sunshine; slight westerly wind; temperature zero at start, 10° at return. 18 inches of snow. One observer rode 18 miles on wood sleigh, two observers (together) travelled 6 miles on snowshoes.

Canada Ruffed Grouse 11, Hairy Woodpecker 1, Blue Jay 3, Canada Jay 2, Starling 1, Pine Grosbeak 2, (one rosy male), Redpoll 2, Snow Bunting 31, Black-capped Chickadee 6.

Total 9 species, 59 individuals. (The two Canada Jays were at our feeding station. At least four have been about since November 8th. A Northern Shrike, Pileated Woodpecker and

White-breasted Nuthatch are residents).—EDNA G. ROSS.

HAMILTON, ONTARIO, December 28th, 1929.—The annual bird census taken by members of the Hamilton Bird Protection Society, took place on Saturday, December 28, and a fine list of birds was handed in, despite difficulties caused by the recent heavy snowfall. Four parties covered the territories from the San to Albion mills, through the Wesdale bird sanctuary and around the marsh, as well as the highway across the bay. In all, over one thousand birds were seen, comprising thirty-five species. The list follows: White-breasted Nuthatch, Chickadees, Ruffed Grouse, Downy Woodpeckers, Snow Bunting, Hairy and Red-headed Woodpeckers, Tree Sparrow, Slate-colored Junco, Kentucky Cardinal, Goldfinch, Starlings, Pine Grosbeak, Evening Grosbeak, Blue Jays, Red-shouldered Hawk, Ring-necked Pheasant, Crows, Herring Gulls, Great Black-backed Gulls, Glaucous Gulls, Black Ducks, Buffleheads, Greater Scaup, Lesser Scaup, American Goldeneye, White-winged Scoter, Hooded Merganser, Red-breasted Merganser, American Merganser, Mallard, Holboell Grebes, Horned Grebes, Common Loon, Ring-billed Gulls.

On December 30 other birds were noted, but not included in this list. Chief among these was a flock of 50 purple finch, proving that the birds are here, if a person has the time and patience to look for them.

BRANT COUNTY, ONTARIO, December 28th, 1929.—The Brant County Ornithological Assotion, now a little over one year old, held its second Christmas Bird Census on Saturday, Dec. 28th, and while far from satisfactory to some of its members was a decided improvement over last year when almost the entire club was sick with the 'flu. Following is the report of the Bird Census.

Three field parties were out in three localities as follows: Party No. 1, H. Fulcher. Along west bank of Grand River from T. H. & B. Ry. crossing south to Bell Homestead and returning via Farrington Heights and county roads to Brantford on foot covering about 5 miles from 1 p.m. till dark. Party No. 2, N. Perry and W. G. Neff took Radial north from Brantford to Oak Park stop, continued north from stop to Old Alabastine mines below Paris, then followed down river towards Brantford to Whiteman's Creek, followed up creek valley about 1 mile and returned to river then followed the general course of river back to Brantford, covering about 14 miles on foot from 10 a.m. till dark. Party No. 3, G. Haddow, D. Williams, north-east from city at Grand St. to Eddy's Bush, east to Lynden road and returned to city at West St., 1 p.m. till dark, covered 6 miles on foot. There was a heavy fog till about 3.30 p.m. making visibility poor, which did not completely break up till nearly sunset. The temperature at noon was about 41°F and walking rather heavy owing to depth of snow which was about 18″ in the open and became quite slushy after noon. Following is the aggregate census of the three parties:

Herring Gull 10, American Merganser 4, Ring-neck Pheasants 9 (tracks and stools numerous showing remarkable increase of this species in last three years), Goshawk 1, Long-eared Owl 1; (found fresh killed) Screech Owl 1; Kingfisher 2, Hairy Woodpecker 9, Blue Jay 17, American Crow 3, Starling 1000 plus or minus, Downy Woodpecker 9, Tree Sparrow 25, Slate-colored Junco 28, Cardinal 6, (two others heard), North- ern Shrike 3, Brown Creeper 7,, White-breasted Nuthatch 17, Black-capped Chickadee 173, Golden-crowned Kinglet 2. Total 20 species 1321 individuals plus the House Sparrows. Worthy of note is the absence of Snowflakes, Horned Larks, and Redpolls which areually us abundant in this vicinity also absence of Ruffed Grouse and abundance of Pheasants. It is also gratifying to us to note that Cardinals are steadily increasing in South Brant at least. North Brant, which is considerably higher in elevation, has no Cardinals to our knowledge.—BRANT COUNTY ORNITHOLOGICAL ASSOCIATION, W. G. NEFF, President, G. N. PERRY, Secretary-Treasurer.

ARNPRIOR, ONTARIO, December 25th, 1929.—9 a.m. to 5 p.m. Cloudy with light snow; 16 inches of snow; wind east, light; temperature 8° at start, 12° at return. Distance covered twenty miles on snowshoes. Observers separate,, one travelling south-east from Arnprior through Nopiming Crown Game Sanctuary to Marshalls Bay and return, the other working north-east from Arnprior along the shores of the Madawaska River and Lac des Chats to the village of Braeside, returning about one mile inland.

Canada Ruffed Grouse 22, Hairy Woodpecker 1, Downy Woodpecker 2, Blue Jay 7, European Starling 8, Evening Grosbeak 63, Pine Grosbeak 53, Redpoll 56, Pine Siskin 35, Snow Bunting 7, House Sparrow 1 plus, Brown Creeper 1, White-breasted Nuthatch 4, Red-breasted Nuthatch 10, Black-capped Chickadee 86. Total, 15 species, 356 plus individuals.

Probably the most pleasing feature of the above list is the number of Ruffed Grouse observed today. After several years of alarming scarcity, this valuable and interesting species has apparently

come back. While all but one of the birds were found within the confines of Nopiming Sanctuary, observations made and reports received from various sections of the country surrounding Arnprior indicate a very gratifying increase.

The scarcity of Woodpeckers of all species and the abundance of the Red-breasted Nuthatch are noteworthy. A heavy crop of spruce cones undoubtedly accounts for the presence of the latter species, it being the first time since 1925 that we have been able to include it in our Christmas list. All the Evening Grosbeaks observed today were found in one flock, feeding as usual on the fruit of the Manitoba Maple (*Negundo aceroides*).

During the past autumn, the unusual abundance of the Canada Jay attracted wide attention. The species was first observed on September 22 and from that date until about the middle of November it was noted in all parts of Renfrew County. While it is a permanent resident in the northern extremity of the County, it is a very unusual visitant at Arnprior and rarely appears in as large numbers as it did on this occasion.

Seen recently: December 26th, American Golden-eye; December 31st, Northern Shrike.—CHARLES MACNAMARA AND LIGUORI GORMLEY.

COMOX, VANCOUVER ISLAND, B.C. 27th December, 1929.—10.30 a.m. to 4.30 p.m. Weather stormy at start, later fine. Temperature about 45°. Five miles on foot. Along river bank and then shore line, Courtenay to Comox Harbour. Observers together.

Western Grebe 2, Holboell's Grebe 1, Horned Grebe 9, Loon 5, Red-throated Loon 1, Glaucous Winged Gull 200*, Shortbilled Gull 100*, White Crested Cormorant 1, Violet Green Cormorant 1, American Merganser 2, Redbreasted Merganser 50*, Hooded Merganser 1, American Widgeon 1500*, Canvas-back Duck 4, Pintail 2, Mallard 1000*, Greater Scaup and Lesser Scaup 400*, American Golden Eye 500*, Barrow Golden Eye 1*, Buffle-head 100*, American Scoter 1*, White Winged Scoter 3000*, Surf Scoter 500*, North West Heron 1, Coot 21, Oregon Ruffed Grouse 3, Bald Eagle 1, Kingfisher 2, Harris' Woodpecker 1, Flicker 1, Stellar's Jay 1, North Western Crow 125*, Meadowlark 1, Brewer's Blackbird 50*, California Purple Finch 1, Pine Siskin 15, Oregon Junco 50*, Fox Sparrow 3, Oregon Towhee 12, North Western Bewick Wren 3, Winter Wren 12, Orgeon Chickadee 8*, Golden-crowned Kinglet 2, California Quail 25, English Pheasant 8, House Sparrow 1.—THEED PEARSE and D. and P. GUTHRIE.

* Estimated and certainly more.

KINGSTON, ONTARIO, December 27th, 1929.—1 p.m. to 5 p.m. Cloudy; 3 feet of snow; wind, south-west, fresh; temperature 34°; lakes, rivers and creeks frozen over with heavy ice. Six miles on foot; observer alone.

Herring and Ring-billed Gulls 200, Glaucous Gull 1, Crows 75, Starlings 100, Snow Buntings 15, Chickadees 5. Total 7 species, about 400 individuals. No Pheasants seen but numerous tracks noted in the deep snow.—EDWIN BEAUPRE.

TORONTO, ONTARIO, December 22nd, 1929.—Sunday, December 22nd was chosen by the Brodie Club of Toronto as the day for their 5th Christmas bird census. The choice was a fortunate one and the weather was ideal for the occasion. The sun shone for the greater part of the day, making one of the few sunny days in the month, and the temperature was just low enough to make outdoor work brisk, the mean for the day being 19. The wind was light, from 9 to 14 miles, from the West and Northwest.

A heavy blanket of snow has covered the ground since early in the month and rain and sleet during the third week formed a hard crust which make walking delightful everywhere. This enabled the observers to cover much more ground than would have been possible in soft snow.

Seven parties worked the Toronto area from the lake shore North, East, and West of the City. Twenty-two individuals contributed to the list.

First party—Mr. and Mrs. Stuart Thompson, C. Richards and F. Smith. Eastern Don Valley. 8.30 a.m. to 1.30 p.m. Sixteen species.

Second party—J. L. Baillie, R. and F. Dingman, A. Patterson. North of the City to York Mills. 8.30 a.m. to 12.30 p.m. Fifteen species.

Third party—E. J. Deacon. West branch of the Don River from Leaside Northward. 10 a.m. to 1 p.m. Five species.

Fourth party—T. F. McIlwraith, R. J. Rutter, E. Q. Bitton, Ralph Bennett. Lake shore from Woodbine Beach on the East to Toronto Exhibition Grounds on the West. 8 a.m. to 2 p.m. Sixteen species.

Fifth party—Dr. Paul Harrington, R. V. Lindsay, John Townson, W. Owens. Sunnyside Beach, High Park, Humber Valley North to Lambton. 8 a.m. to 1 p.m. Twenty-six species.

Sixth party—C. Hope, L. J. Milne, H. P. Stovell. Northwest of City, Mount Dennis and Cedarvale. 8 a.m. to 3.15 p.m. Nineteen species.

Seventh party—F. H. Emery. Credit River valley in vicinity of Erindale. 9.15 a.m. to 3 p.m. Fourteen species.

Total birds seen, including five reported by Mr. J. H. Fleming:

Great Black-backed Gull 3, Herring Gull 287, Ring-billed Gull 19, American Merganser 16, Scaup Duck 108, Golden-eye 209, Buffle-head 2, Old Squaw 300, Ring-necked Pheasant 2, Ruffed Grouse 7, Cooper's Hawk 2, Red-tailed Hawk 1, Red-shouldered Hawk 1, Sparrow Hawk 2, Long-eared Owl 2, Screech Owl 1, Hawk Owl 1, Hairy Woodpecker 12, Downy Woodpecker 16, Red-headed Woodpecker 2, Blue Jay 18, Canada Jay 1, Crow 7, Starling 314, Rusty Blackbird 1, Pine Grosbeak 34, Purple Finch 6, House Sparrow abundant, uncounted, Redpoll 70, Goldfinch 29, Pine Siskin 155, Snow Bunting 99, Lapland Longspur 3, Tree Sparrow 118, Junco 10, Song Sparrow 4, Swamp Sparrow 1, Northern Shrike 4, Winter Wren 2, White-breasted Nuthatch 9, Chickadee 138. 41 species, 2016 individuals. The House Sparrow is not included in the individual count.

Although exactly the same number of species were seen this year as last, an analysis of the records for 1929 shows a much higher percentage of Winter birds, both in species and individuals, and a correspondingly low number of those half-hardy summer birds which are usually represented. Four strictly Winter birds appear for the first time—Hawk Owl, Canada Jay, Lapland Longspur and Pine Grosbeak. The first three are quite rare here but the Grosbeak, though missed on other censuses, appears at Toronto in some numbers practically every winter. Ruffed Grouse are always to be found in the Credit Valley but this locality is included this year for the first time. The Red-headed Woodpecker and Rusty Blackbird, two new representatives of species with more Southern winter distribution were both observed by number 5 party in High Park, which place also yielded the "find" of the day, the Hawk Owl. The Brown Creeper is absent from the census for the first time and local observers have noted a scarcity of Creepers this Autumn and Winter.

Other birds seen recently at Toronto and not included on the above list include:

Holboell's Grebe, Glaucous Gull, Meadowlark, Evening Grosbeak, White-throated Sparrow, Cardinal and Robin.—THE BRODIE CLUB, R. J RUTTER, Secretary.

ATHENS, ONTARIO, December 30th, 1929.—Time: 10 a.m.–1 p.m., 2.30 p.m.–5 p.m. Distance: 8 miles on foot. Temperature: 28° at start, 27° on return. Weather conditions; dull and cloudy all day, a strong south-west breeze during the whole time. A strong crust made excellent walking and a light snow on top gave splendid tracking conditions.

Area covered: start made one mile west of Athens on Delta road. South to cedar swamp and pine woods, then north-west across "Oakleaf" road to another pine wood and return. In afternoon, travelled north from same starting place to a dense evergreen wood and swamps.

Birds Identified

Great Horned Owl 1, Bluejay 6, Ruffed Grouse 9, Snow Bunting 30, Redpoll 25, Junco (?) 1, Chickadee 25, White-breasted Nutthatch 2. Total: species 8, individuals 99.—MURRAY W. CURTIS.

OTTAWA, ONTARIO, December 22nd, 1929.—Twenty observers, grouped in nine parties, co-operated in taking the Christmas Bird Census of 1929 in the Ottawa area, on December 22nd. Wintry weather had prevailed at Ottawa since the closing days of November, and in consequence the ground was covered with about fifteen inches of snow, on top of which was a crust, formed by a fall of sleet, that was not quite strong enough to support the weight of a man. This made walking very difficult, either with or without snowshoes, confined the observers to travelled roads to an unusual extent, and forced some of them at times to proceed on all fours!

The result of the strenuous efforts of the census-takers is a very interesting report, showing 3,031 individual birds, of 24 species, as present in the area on the census-day. These include, in spite of the wintry conditions, such half-hardy species as the Goldfinch, Tree Sparrow, and Song Sparrow.

It is interesting to note that the introduced European Starling, which first appeared in our Christmas Bird Census in 1924, has not failed to appear in it each year since then, and, during the past few years, has been reported in ever-increasing numbers, which this year have reached 617, giving this species third place in the list in point of abundance.

The personnel of the observing groups and the routes that they followed are stated below. Routes followed in previous censuses are referred to by numbers, which are explained in *The Canadian Field-Naturalist*, Vol. XXXIX, p. 24; Vol. XL, p. 12; and Vol. XLI, pp. 9–10.

FIRST PARTY: Wilmot Lloyd, Elizabeth Lloyd, Helen Lloyd, H. A. Lloyd, Route 1 (but Rockcliffe Park to Rifle Ranges only), 3 miles on foot, 8.00 a.m. to 9.30 a.m. and then feeding station all day. SECOND PARTY: C. E. Johnson and

C. M. Sternberg, Route 2, 8 miles by auto, 8 on foot, 8.45 a.m. to 3.45 p.m. THIRD PARTY: D. B. DeLury and R. E. DeLury, Route 3, 16 miles on foot, 9.00 a.m. to 4.20 p.m. FOURTH PARTY: W. H. Lanceley and F. H. Ostrom, Route 4, 2 miles by street-car, 10 on foot, 10.30 a.m. to 3.30 p.m. FIFTH PARTY: Robert Lockwood and Harlow Wright, Route 5, 15 miles by street-car, 12 on foot, 7.30 a.m. to 4.45 p.m. Route 6, unoccupied. SIXTH PARTY: Harrison F. Lewis and Grant Lathe, Route 7, 14 miles by auto, 16 on foot, 7.30 a.m. to 4.30 p.m. SEVENTH PARTY: Hoyes Lloyd and B. A. Fauvel, Route 8, 19 miles by auto, 5 on foot, 8.00 a.m. to 2.00 p.m. Routes 9 and 10, unoccupied. EIGHTH PARTY: R. Sternberg and Joseph Skillen, Route 11, southeast to Rideau Park and return, 18 miles on foot, 9.00 a.m. to 3.30 p.m. NINTH PARTY: D. Baker and A. Larocque, Route 12, south to Leitrim and vicinity, east of Metcalfe Road, 25 miles on foot, 9.00 a.m. to 7.00 p.m.

WEATHER: Local sunrise, 7.43 a.m.; local sunset, 4.21 p.m. Cloudiness 10%; wind light northwest morning and evening, stronger at noon; ground covered with 15 to 18 inches of snow; temperature 0° at 7.30 a.m., 6° at 3.00 p.m., 0° at 6.00 p.m.

	ROUTE NUMBERS									TOTAL
SPECIES	1	2	3	4	5	7	8	11	12	
American Merganser			4							4
American Golden-eye			3		28					31
Canada Ruffed Grouse		2							1	3
Great Horned Owl		1								1
Hairy Woodpecker	4		1			1			2	8
Downy Woodpecker	4	3	1	1	1				3	13
Blue Jay	1	1			2	3			2	9
Canada Jay							2			2
Crow		160	28	19	23					230
Starling		500	95		9			3	10	617
Pine Grosbeak		1	69	3		5	3			81
House Sparrow		530	100	87	27	18	47	12	15	836
Crossbill (sp.)						14				14
Redpoll			78		11	18				107
Goldfinch					2					2
Pine Siskin		3			4					7
Snow Bunting		426	126		1	76	10	167	50	856
Tree Sparrow					2					2
Song Sparrow								1		1
Northern Shrike		2	2							4
White-breasted Nuthatch	3	2	3		2	1			3	14
Red-breasted Nuthatch					12					12
Chickadee (Black-capped)	12	15	13	5	87	10	7	15	10	174
Robin			3							3
Total individuals	24	1646	526	115	211	146	69	198	96	3031
Total species	5	13	14	5	14	9	5	5	9	24

A Barred Owl had been seen frequently, during the previous month and a half, near the residence of R. E. DeLury, but was missed on the 22nd, although seen December 21st.—HARRISON F. LEWIS.

GLIMPSES OF LITTLE-KNOWN WESTERN LAKES AND THEIR BIRD LIFE

By J. A. MUNRO

(Continued from page 17)

STUMP LAKE, BRITISH COLUMBIA

STUMP LAKE, in the Nicola Valley, British Columbia, is approximately five miles long and half a mile wide. It lies north and south between high, grass-covered hills which, on the west side, are entirely open except for occasional isolated Douglas firs, growing chiefly along certain narrow coulees. The eastern slopes, comprising the areas still held by the Crown in the name of the Province of British Columbia, are fairly well wooded with Douglas fir. The shore line is irregular with numerous bays and stony points; the water clear, deep and slightly alkaline. Beaches are chiefly of hard sand and gravel. The upper portions in many places are strewn with rounded boulders, those nearest the water being coated with alkaline deposit. A small bed of bog-rush occurs in a bay near the south end of the lake and there are probably other patches, but generally speaking there is little aquatic vegetation. Fresh-water shrimps are plentiful and perhaps form the chief animal food of the ducks frequenting the lake which, at the time of my visit, were represented by Lesser Scaups and Barrow's Golden-eye, the latter, which were courting, being in the majority.

Stump Lake has long been famous for its goose shooting. Geese come to the lake for sand, to rest on the open water and occasionally to feed on the grass along the adjacent hillsides. The chief feeding-ground, however, is reported to be on the "dry farms" on the hills between Stump Lake and Kamloops.

VASEAUX LAKE, BRITISH COLUMBIA

Vaseaux Lake, one of a chain of lakes in the Okanagan System, harbours each winter a band of Trumpeter Swans.

A description of the topography and general bird life of the region will be found in Volume XXXVII of *The Canadian Field-Naturalist*, pp. 66–69; "Bird Notes made at Vaseaux Lake, South Okanagan, British Columbia", by Mr. and Mrs. T. L. Thacker.

The region at the north end of the lake contains the most valuable feeding grounds and this is the portion most frequented by Trumpeter Swans. Here the lake is shallow and supports a heavy growth of aquatic vegetation; in one place the red water-lily, *Nymphaea microphylla*, extends over a space of several acres, the pads touching or overlapping; sago pondweed, *Potamogeton pectinatus*—and this is a favorite food of the Trumpeter in winter, the seeds being scooped up from the muddy bottom—grows in great profusion while coontail, *Ceratophyllum demersum*, and other water plants are well represented. The river bottom for two miles north of this point is approximately half a mile wide, partly marsh and partly hay meadows, the latter sometimes inundated during high water. The marsh area extends several hundred yards along the west shore of the lake. The river, which varies from twenty to thirty yards in width, flows through the east side of the flat and enters the lake at the north-east corner; on the west side is a narrow slough or false channel connected, at high water, with the lake and with the river proper. This feeding ground is used also by Canada Geese and ducks of many species, some remaining during the winter so long as the shallow areas remain open. Blue-winged Teal and Cinnamon Teal, both scarce in the Okanagan Valleym have been observed on the marsh, and here, on September 7th, 1924, I found seven Wood Ducks, the first encountered locally, for many years.

Reports of the Trumpeter Swan in the Okanagan Valley date from its first settlement by white men in the early seventy's. Old residents tell of Swans breeding regularly at Swan Lake near Vernon and at Vaseaux Lake (then called Swan Lake also). Perhaps they nested beside other marshy lakes in this region but of these nesting grounds we have no definite knowledge nor has any record been kept of when they last nested in the valley.

It has been impossible to obtain reliable information regarding the number of Swans that wintered or passed through the valley in those early days. Estimates given by the early settlers are contradictory but it is certain that many were shot. Both Indians and white men killed the cygnets for food, and later, when the growing settlement furnished a demand, both adults and young were killed for their down. Still later, when sport was the chief incentive to hunting, the birds were killed for trophies and the destruction increased. When feeding in the river during the late winter it was an easy matter to stalk them behind the sheltering brush on the shore and few young hunters could resist such a tempting target.

By the year 1900 it was apparent to the most

casual observer that Swans were rapidly decreasing in numbers and a certain amount of sentiment in favour of their protection developed. Some time later it was brought to the attention of the Provincial Game Department and swans were removed from the list of game birds. But the killing still went on. Usually the birds were killed by rifle fire and often left to drift ashore and freeze into the ice—this wanton killing being confined chiefly to visiting hunters and newcomers to the valley. The older residents were beginning to appreciate the aesthetic value of these splendid birds

Even with continual persecution Trumpeter Swans were not uncommon as late as 1906, but the following eight years showed a marked decrease. Fewer birds were seen passing over and a smaller proportion elected to remain through the winter. Through the duration of the war when many ranches in the valley were abandoned and less hunting was done than formerly, the birds enjoyed a certain degree of immunity and the wintering flock increased. Thus when Vaseaux Lake was visited in the winter of 1917-18, nineteen birds were counted.

During subsequent years the size of the flock fluctuated, but did not exceed sixteen at any time. In the winter of 1924-25, six birds were lost through lead-poisoning. In the winter of 1926-27 only two birds remained on the lake but this probably does not indicate a loss of birds for it is known that two of the bands wintering further north contained more birds than usual. The fact that cygnets are always present in the flock, sometimes even outnumbering the adults, gives hope for the future of the species. Special protection has been given the Vaseaux Lake band during the past eight years, and, as far as known, none have been shot during that time.

One's first experience with a hitherto unknown bird leaves a lasting impression and my first sight of Trumpeter Swans was no exception to this rule. From a marshy shore on the west side of Vaseaux Lake where we had gone in the expectation of seeing Swans, I examined the expanse of water with binoculars and soon picked up a band of five, all adults, swimming close to the shore on the opposite side of the lake, which at this point was outlined with brown, withered rushes. Against the background burnished by the setting sun, they fairly glistened in their snowy whiteness. Powerful binoculars brought them very near and it was hard to realize that these magnificent, stately birds were not tame swans on an artificial lake. A few minutes later three birds rose from the water and with slow, measured wing-beats flew diagonally across the lake towards us, quartering a stiff north breeze that, in its more violent gusts, stirred the shallows into creamy foam. These pitched three hundreds yards from where we stood and immediately commenced feeding with long necks submerged to the shoulders. Slowly they worked up wind close to shore while we watched from the sheltering brush. Half an hour later the two remaining birds left the far shore and paddled swiftly across the lake to join their companions.

Another vivid memory concerns a January day four years later. This time also we had approached the lake by a trail along the west side of the river, not, as is the usual custom, by the main road on the east side. The river was open for its entire length; the lake frozen over—clear glassy ice without drifted snow. The swans were seen standing on the ice at the mouth of the river, close to the east shore about three-quarters of a mile distant. Relaxed in sleep with necks folded backward they looked like cream-colored mounds on the clear ice. In order to obtain a closer view we returned to Okanagan Falls and continued south on the east side of the river to a point nearly opposite its mouth. From there we walked cautiously through the cover afforded by the antelope bush and small trees and managed to approach within 200 yards of the resting birds. In a few moments they caught sight of us, elevated their long necks in alarm and soon afterwards took flight. Eleven birds composed the band, only two being cygnets. All flew south across the frozen lake in regular alignment, the two cygnets bringing up the rear, and were last seen rising in the air to clear the tree tops at the south end of the lake.

Yet another sight of the great white birds on February 19th, 1926, will not soon be forgotten. It had been an unusually mild winter, the first Mountain Bluebirds had come drifting up the valley, grass was turning green and in sheltered places was bright with the gold of early crowfoot. Earlier in the day, near the south end of the lake we had watched a flock of 24 American Mergansers, equally divided as to sex, swim out from the shore, the handsome drakes coruscating in the noontide light. Handsomest of all were several individuals who, in every few yards of progress flashed their brilliant orange tarsi in giving the typical back kick of the courtship display. An adult Bald Eagle, soaring so easily and gracefully, had terrified a band of Coots, five hundred strong, so that they gathered in a compact mass—a black, swaying carpet moving across the water. But these sights were eclipsed

when we found nine swans, four adults and five cygnets, feeding in the slough near the mouth of the river. At one time all were "tipping" showing only a triangular patch of white above the surface—the end of the tail forming the apex of the triangle—while black feet paddled furiously to hold this position. It was a most curious sight, nine little white tents that suddenly would be transformed into graceful, straight-necked Trumpeters! A short distance beyond them, in comparison looking no larger than Buffle-heads, twenty-three Canada Geese rested on the quiet water.

Vaseaux Lake is about the northern limit of the Upper Sonoran association that in a narrow tongue extends into the Okanagan Valley. The White-throated Swift and the Canyon Wren nest in the rugged cliffs that overlook the lake, and the Sage Thrasher has been found in the sage-brush hills not far distant. Farther south on a bald prairie, above the river bottom, Burrowing Owls nest regularly and on the adjacent hills are found Long-billed Curlew. In the swampy river bottom itself, thickly grown up with willow, alder and birch, many interesting birds find conditions to their liking.

Here on May 29th, 1926, was heard a wonderful bird chorus when we struck out at 5 a.m.; Willow Thrushes, Bullock's Orioles, Meadowlarks, Song Sparrows, Yellow-throats, Western Kingbirds, House Wrens, each contributed to the concert. One pleasant recollection of the morning is that of a resplendent Chat, whistling from a dead willow top twenty yards away, while the early sun glittered on his golden breast. Disturbed by a "squeak" he dropped into the brush almost at my feet, peered upward for a second, then disappeared in the greenery. Later we found them fairly numerous, the unmistakable whistle coming from various points in the brush; places that were found to be usually inaccessible by reason of the density of growth, or the depth of water underfoot, or by a combination of both. Inaccessible, that is, without a great deal of noise, which effectually silenced the bird before one was close enough to obtain a glimpse.

It is at Vaseaux Lake that several pairs of Canada Geese nest yearly in Osprey's nests as has before been recorded. During the past two years a considerable increase of this species has been noted in the Southern Okanagan Valley. This valuable feeding ground for water fowl, where shooting is prohibited, has attracted and held a large number of geese during migration and more birds have remained to nest than was formerly the case. The increase in breeding birds is due partly to the protection afforded on this particular area and partly to the fact that the cutting of marsh hay is prohibited. Since this regulation was put into effect there has been ample nesting cover, and of this the geese have taken full advantage.

MABEL LAKE, BRITISH COLUMBIA

Mighty hills mirrored in waters of sapphire blue; clean-barked Mountain White Pines towering high above lesser hemlocks and cedars; the mingled resinous scents of many conifers; the swift-flowing Shuswap where it enters the lake through a wide swampy bottom; a narrow, sloping beach of silvery sand and in the background lofty cottonwoods each with a well defined ring two feet above the ground marking the height of early summer freshets—such are September memories of Mabel Lake.

Not a bird country this, the lake is too closed in, the forest too heavy, but there is some magic that draws one back year after year. Perhaps it is the solitude "pleasantly unpeopled" and the expectation which solitude inspires; perhaps it is the comfort of the steadfast hills or the lure of the sand beach where one may read so many tales.

And it is to this beach that one first turns in eagerness to scan its wet margin for traces of the shy wild-creatures. Thus on a hot September afternoon we walked on and on around the full crescent of the shore, marking where a beaver had dragged poplar branches across the sand to the swamp beyond, where a bear had drunk, the irregular wanderings of an inquisitive mink, the deliberate journey of a muskrat and tracks of otter, cougar, coyote and mule deer. Of these none were seen except the deer, a doe and fawn, which came to the edge of the cottonwoods in the evening dusk.

Patches of vivid green, where a trickle from the swamp hardened the sand, suggested Rails but none were found nor any tracks. The vegetation in these little swales is chiefly a fine Equisetum with here and there clumps of slough grass and spikes of fragrant peppermint. One large meadow behind the fringing cottonwoods, perhaps 10 acres or more, was covered with this class of vegetation and clumps of water parsnip. An inviting place it looked and seemed ideal for sparrows but none could we find save migrant Savannahs.

Sixty species of land birds have been observed along the lake but few of these are common. Amongst the more interesting species are: Ravens which nest in the cliffs high above the lake; Bald Eagles and Ospreys that yearly occupy certain tall cottonwoods; both species of Three-toed Woodpeckers resident in stands of burnt

timber; Olive-sided Flycatchers and Rocky Mountain Jays—these latter indicating a life zone predominantly Canadian.

Water-fowl are not abundant owing to the restricted areas of feeding ground on this deep-water lake. Old residents tell of Trumpeter Swans wintering regularly until a few years ago and this is the most interesting species recorded. Mergansers are fairly common but before discussing this much-abused species it will be necessary to present a short topographical sketch which is pertinent in this connection.

Mabel Lake forms part of the Shuswap River system which rises in the foothills of the Gold Range south-west of Revelstoke; flows in a general southerly direction for approximately fifty miles to enter Sugar Lake; thence follows the contour of the Silver hills, south, east, then north, in the form of a loop and enters Mabel Lake at its southern end. After leaving Mabel Lake it is known as the Spullumcheen. Flowing west and north again in the form of a loop it enters Shuswap Lake at the southern end of Mara Arm finally to reach the sea by way of the Thompson and Fraser. Salmon ascend the river at least as far as Sugar Lake and smolt of the various species are present in the river all summer. Game fish common on this system are the Dolly Varden Charr, Lake Charr and the so-called Rainbow Trout. Various coarse fish are also common, namely Williamson's Whitefish, Squaw fish, Mullet and a chub-like fish *Myocheilus caurinus*.

Thus the American Merganser, which nests along the river and on portions of the lake shore—and also winters on the open stretches of river—has a variety of fish from which to choose. Complaints have been received charging this species with damage to salmon fry on the Shuswap, and, while some evidence of this has been noted it is believed that such damage is negligible.

The only time that Mergansers are abundant occurs during the run of Kokanee in the autumn. This fish, a degenerate salmon rarely exceeding twelve inches in length, ascends the river from the depths of the lake, spawns and dies. At such times Mergansers can be seen catching these fish on their spawning beds and in the shallow riffles as the fish work up-stream. Thus on September 19th, 1921, at the height of the Kokanee run, fifty Mergansers were seen at the mouth of the river where it enters Mabel Lake; some fishing in the shallows, others standing on a sand bar a short distance from the river's mouth. During the week following, flights of Mergansers were observed daily; a succession of small bands descending the river at dusk to spend the night on the lake, the return flight to the feeding grounds taking place before sunrise in the morning.

Mergansers also take the spent fish, as do other birds, in fact this time of year is a feasting season for all fish-eating creatures. Thin and poor after reaching the spawning grounds, Kokanee are of little economic value and few people resent the toll taken by Mergansers.

To the swamps, behind the beach at the head of the lake and along the river, come flocks of Mallard in the autumn, and Gadwall, Pintail, Baldpate and Green-winged Teal feed in the weedy shallows along shore.

The portion of the lake contained within the Railway Belt is similar to the southern end which previously has been described. The water is deep, the shore is rocky with occasional sandy beaches and at the mouths of the various tributary creeks are sandy flats where tall cottonwoods stand out in relief against a background of darker conifers. The surrounding mountains are high and rugged, several being over 6500 feet. The valley narrows at the extreme north end of the lake and here is the usual cottonwood flat bordering a sandy beach. Through this enters the tributary Wap river and beyond are several small sloughs outlined by willows. There is a small shallow bay containing considerable weed growth, chiefly *Potamogeton natans*, *Potamogeton perfoliatus* and *Sagittaria latifolia*.

FISH LAKE, BRITISH COLUMBIA

Fish Lake, at an altitude of 4100 feet, 22 miles south of Kamloops, lies in a narrow valley surrounded by low, timbered hills. Comprising two separate bodies of water joined by a short, narrow channel, this lake is approximately two and a half miles in length—the lesser portion, known locally as Little Lake, being half a mile long. Beside the narrows is a small settlement consisting of a Forest Ranger Station, a summer hotel and a number of summer cottages. This district was visited on November 1st, 1921, and again from June 2nd to June 7th, 1922, inclusive.

The shores of both lakes are timbered with Murray Pine, Engleman Spruce and Douglas Fir, Murray Pine being the predominating species. The water's edge is bordered by willow and alder and on the slopes facing the north shore, conspicuous against the prevailing dark green of the conifers, are several small stands of Quaking Aspen. For some distance out from the shore occurs a sparse growth of bog-rush, reaching its greatest development in the shallow water and muddy bottom at the west end of the lake and partially hiding the entrance to a stream which drains the two lakes. This sluggish

stream, known as Meadow Creek, flows in a general south-westerly direction—to empty into Mammit Lake some eighteen miles distant—through a wide beaver meadow covered with marsh grass, its course being defined by clumps of alder and willow. For some three hundred yards from its mouth the shores of the stream are marshy with several species of Potamogetons and sedges represented. Here the bottom is of soft, brownish silt but beyond are gravel beds on a sandy bottom and this portion of the stream comprises the only spawning ground for trout in the two lakes.

Approximately four hundred yards down the stream an old beaver dam has been added to and made fairly permanent in order to keep the lake at approximately the same level, and a wooden box-culvert provides for the passage of fish during the spawning season On June 3rd fish up to eighteen inches in length could be seen passing through this culvert or holding themselves stationery against the current. Other fish had congregated in a pool just below the entrance to the passageway and these frequently broke water. For a week prior to my arrival in June, 1922, beaver had been filling the passage-way with brush every night, entailing daily attention from the Forest Ranger in order that fish might pass through. Indications of the beaver's activities were noted in other places, the most interesting being a large beaver-house on the lake shore.

At this time information was sought regarding the local feeding habits of Loons; this investigation being the result of complaints received in connection with alleged damage to fishing interests caused by this species. In connection with this work a careful survey of the two divisions of Fish Lake was made by boat and the shores of a small marshy lake, several hundred yards inland and separated from the main lake by a beaver meadow, was explored on foot. Only one pair of Loons nested on the main lake. The nest, built on a small sedge-covered island close to the entrance of a lagoon, was constructed of coarse marsh grass in the shape of a mound eighteen inches high and eighteen inches in diameter and contained the usual complement of two eggs. The nest of a second pair, that occupied the small marshy lake referred to above, could not be located owing to the boggy nature of the shore which prevented wading. A third pair and a non-breeding female inhabited "Little Lake". This made a total of seven birds on the Fish Lake waters.

Two birds were collected and the stomach contents analysed as follows:—

Adult female (breeding) *June 5th, 1922*—Gravel and a small quantity of comminuted matter, probably the larvae-cases of caddis.

Adult female, *June 6th, 1922*—Gravel and a small quantity of comminuted matter thought to be the remains of fresh-water shrimps (Amphipoda).

(The analysis of the stomach contents of an adult male taken at Mara Lake, B.C., on May 18th, 1922, is thought to be of sufficient interest for inclusion here).

Adult male—Gravel remains of the inner surface of shell of the common bivalve of the region and a portion of the shell of an unidentified *Planorbis*.

It was considered that the small number of loons present could have no appreciable effect on the supply of trout in a body of water comprising one and a half square miles, even if no other food was taken. That loons feed entirely on fish is a statement frequently made by sportsmen without supporting data, whereas a study of the stomach contents of specimens taken in widely separated districts offers evidence in contradiction to this generally accepted opinion.

It is reported that the fishing in Fish Lake has fallen off considerable in recent years and ingenious theories, such as the destruction of fry by loons, are offered to account for the scarcity of fish. Old timers speak regretfully of early days when *hundreds* of fish could be caught in a few hours, not realizing that in such statements lies the true explanation of the present scarcity. The history of fishing in Fish Lake is a duplication of what has occurred in practically every British Columbia lake made accessible by automobile road. In some cases depletion is hastened by a lowering of the water on the spawning beds through its diversion for irrigating purposes. This is said to have occurred on Meadow Creek, the sole spawning grounds for the Fish Lake trout and in addition to this the creek was dammed by beaver for two successive years so that fish were unable to reach the spawning beds. Apparently a large number of fish still exist in the lake as many were seen jumping at all times of the day. With the reduction of fish has probably occurred a great increase of fresh-water shrimps—the lake now swarms with them—and the remaining fish being well fed do not rise to the fly so readily as formerly.

As was to be expected on a lake frequented by loons, other species of water-fowl were scarce and on Fish Lake itself consisted of the following, viz; one pair of Barrow's Golden-eye, one pair of Buffle Head, one pair Holboell's Grebe. These were thought to be breeding. One pair of Mallard was seen on "The Little Lake" but they were

only observed once and it was concluded these were visitors from an adjacent lake where several pair were breeding. On the nearby lakes were seen Bonaparte's Gull, American Merganser, Ruddy Duck and Spotted Sandpiper.

Fish Lake is particularly rich in fresh-water shrimps and molluscs and at least three species of Potamogetons occur, all of which are staple articles in the diet of ducks. The small marshy lake referred to above as being tenanted by one pair of loons is suitable in every respect as a breeding place for surface-feeding ducks. Portions of the fore-shore of the main lake and "The Little Lake" are also eminently suitable for breeding grounds. On November 1st, 1922, a flock of Surf Scoters was observed—rather a scarce duck in this locality and hardly to be expected on a lake at this altitude.

The Fish Lake region being in the Canadian Zone some interesting land birds were expected, and in this we were not disappointed. Rocky Mountain Jays, which had been noted as common in November, 1921, were found the following June accompanied by full-grown young in the dark immature plumage. An adult female collected showed dark shaft streaks on the dorsal surface, suggesting possible intergradation with the coast form, *griseus*.

Columbian Chickadees appeared fairly common in the Spruces; here was flushed a Franklin's Grouse.

First in the early morning hours came the alarm-clock whirr of a Red-shafted Flicker on our cabin roof; then followed the vigorous, whistled demand of an Olive-sided Flycatcher (*"Quick, three beers!"* Laing has translated it); then a medley of bird voices, and, dominating by its sheer beauty, clear and cool, deliberate, the golden harmony of Olive-backed Thrushes.

Other land birds noted were:

Western Red-tail, Osprey, Pileated Woodpecker, Red-naped Sapsucker, Alaska Three-toed Woodpecker, Rufous Hummingbird, Hammond's Flycatcher, Western Wood Peewee, Western Chipping Sparrow, Brewer's Blackbird, Red Crossbill, Rusty Song Sparrow, Barn Swallow, Cassin's Vireo, Audubon's Warbler, Yellow Warbler, Interior Tule Wren, Ruby-crowned Kinglet, Red-breasted Nuthatch, Mountain Chickadee, Western Robin and Mountain Bluebird.

(To be concluded)

NOTES ON BIRDS OF THE NORTHERN PART OF THE QUEEN CHARLOTTE ISLANDS IN 1927

By S. J. DARCUS

DURING the year 1927, I spent from April 10th to July 13th in the observation of the bird-life of the northern part of Graham Island and Langara Island.

The primary object of my trip was my search for the breeding grounds of the Marbled Murrelet.

The following is a complete list of birds observed by me during that period.

[The subspecific names here used are not original determinations but are assumed on geographic probabilities as given by recent authors.—*Ornithological Editor.*]

1. *Aechmophorus occidentalis.* WESTERN GREBE.—Observed daily in salt water during the months of April and May.

2. *Colymbus holboelli.* HOLBOELL'S GREBE.—Observed daily in salt water until the middle of May.

3. *Gavia immer.* LOON.—Seen daily in salt water, also in the lakes where it was undoubtedly nesting.

4. *Gavia pacifica.* PACIFIC LOON.—Abundant at sea during April and May. During that time large flocks were seen flying northward.

Observed on the lakes on Graham Island in June in pairs, and often seen flying inland from the sea.

5. *Gavia stellata.* RED-THROATED LOON—This Loon breeds on some of the lakes of Graham Island.

Observed a pair with 2 young on an unnamed lake on that island.

6. *Lunda cirrhata.* TUFTED PUFFIN.—There is one large breeding colony of this species on Langara Island.

When in the vicinity of the nesting cliff on April 23rd no Puffins were seen, but a week later they were there in numbers.

The first eggs were seen on June 8th.

7. *Cerorhinca monocerata.* RHINOCEROS AUKLET.—Observed in numbers off the east coast of Tangara Island. There is no breeding place of the species in this vicinity, these birds probably coming from Forrester Island, 30 miles away.

8. *Ptychoramphus aleuticus.* CASSIN'S AUKLET.—Abundant, breeding all along the coast of Langara Island and along the west coast of Graham Island, where I found scattered breeding colonies for thirty miles.

This is the first of the family to nest, eggs in an advanced state of incubation being seen as early as April 15th.

9. *Aethia pusilla.* LEAST AUKLET.—This small Auklet was observed in pairs off the coast of Langara Island in April. No doubt it winters in these waters as I have found it doing so on the west coast of Vancouver Island.

10. *Synthliboramphus antiquus.* ANCIENT MURRELET.—Abundant; the most abundant of the family on Langara Island, its nesting burrows being found as far as one-quarter mile from the sea.

I also found breeding colonies of the species on both the north and west coasts of Graham Island.

The Indians say it breeds on Hippo Island, about 50 miles down the west coast of Graham. Hippo Island may be the most southerly breeding place of the species.

11. *Brachyramphus marmoratus.* MARBLED MURRELET.—Abundant; one breeding colony found. Observed in numbers, from April to July off the northern coast of Graham Island.

12. *Cepphus columba.* PIGEON GUILLEMOT.—Abundant, and breeding in all suitable places on the coasts of Graham and Langara Islands.

It is a late nester and often lays its eggs in the burrows of the Ancient Murrelet after the young of that species have left the burrow.

13. *Uria troille Californica.* CALIFORNIA MURRE.—Seen in thousands in the sea off both Langara and Graham Islands.

There are no breeding colonies of the species in this part of the Queen Charlottes.

14. *Larus argentatus.* HERRING GULL.—One small breeding colony found in Massett Inlet, the only breeding colony I have found on the Pacific coast.

It nests earlier than the Glaucous-winged Gull, at least two weeks earlier.

15. *Larus glaucescens.* GLAUCOUS-WINGED GULL.—Abundant and nesting in suitable places along the coast of Graham and Langara Islands.

I found large nesting colonies of the species on the west coast of Graham Island.

Also found the species nesting in trees, there being one such colony a mile from the sea on Langara Island and another three miles from the sea on Graham Island.

16. *Puffinus griseus.* DARK-BODIED SHEARWATER.—Abundant off the coast in June and July. Several picked up dead on the shore.

17. *Oceanodroma furcata.* FORK-TAILED PETREL.—Abundant, several large breeding colonies of the species being found.

The first egg of the species was found on May 14th, but most of them were producing their single egg the last week in May.

The Fork-tailed nests at least a month earlier than Leach's Petrel.

18. *Oceanodroma leucorhoa.* LEACH'S PETREL.—Abundant. Mixed breeding colonies of both Leach's and Fork-tailed were found.

The first eggs of Leach's Petrel were found on June 30th.

The egg is indistinguishable from that of the Fork-tailed Petrel.

19. *Phalacrocorax pelagicus robustus.* VIOLET-GREEN CORMORANT.—Abundant. Two large breeding colonies of the species on Lanagra Island.

The largest of these colonies, on the western side of the island, was not occupied in 1926 and according to the Indians had not been occupied for several years.

In 1927 there were at least 500 nests in the colony.

The Crow is the greatest enemy of the Cormorant. I have known every nest in a colony to be robbed of its eggs by Crows and the birds forced to lay again.

20. *Phalacrocorax auritus cincinatus.* WHITE-CRESTED CORMORANT.—One pair of this species were found nesting amongst a colony of Violet-green Cormorants.

21. *Mergus americanus.* AMERICAN MERGANSER.—Common in salt water. Breeding along the streams on Graham Island.

22. *Mergus serrator.* RED-BREASTED MERGANSER.—Not common. Very few were seen.

23. *Lophodytes cucullatus.* HOODED MERGANSER.—I found this Merganser very common on the larger streams on the west coast of Graham Island.

24. *Anas platyrhynchos.* MALLARD.—Common on Graham Island. Nesting.

25. *Mareca americana.* BALDPATE.—A few were seen on the west coast of Graham Island.

26. *Dafila acuta.* PINTAIL.—A few were seen on the west coast of Graham Island.

27. *Histrionicus histrionicus.* HARLEQUIN.—Very common along the coast, mostly males in breeding plumage.

28. *Oidemia americana.* AMERICAN SCOTER.—Very common in the sea during April and May. A few were seen during June and July.

29. *Oidemia deglandi.* WHITE-WINGED SCOTER.—Observed at sea in small flocks throughout the period of my visit.

30. *Oidemia perspicillata.* SURF SCOTER.—Observed in small flocks throughout the period of my visit.

31. *Branta canadensis occidentalis.* WHITE-CHEEKED GOOSE.—Common on Graham Island where numbers of young broods were seen late in May.

While six is the average brood, I saw one pair of old birds with nine young.

32. *Branta nigricans.* BLACK BRANT.—Many large flocks were observed going northwards between April 20th and May 1st at that time many were also observed on the tidal flats.

On June 7th, observed 42 on the northern shore of Graham Island.

33. *Ardea herodias fannini.* NORTH-WESTERN COAST HERON.—Common. Seen daily on tidal flats. There is a large heronry on an island in Massett Inlet.

34. *Grus mexicana.* SAND-HILL CRANE.—Found breeding on the muskegs on Graham Island. According to the Indians, not nearly as common as formerly.

35. *Lobipes lobatus.* NORTHERN PHALAROPE.—Observed in flocks at sea feeding on the insects which frequent the floating masses of kelp. Seen from April to July.

36. *Gallinago delicata.* WILSON'S SNIPE.—Common in April and May on the muskegs on Langara Island, where it was heard "bleating" high up in the air. None were seen or heard after June 1st.

37. *Pisobia minutilla.* LEAST SANDPIPER.—Abundant on the sea beaches in April and May. Absent for a few weeks and seen again, June 28th, being quite common by July 10th.

38. *Pelidna alpina sakhalina.* RED-BACKED SANDPIPER.—Observed in small flocks on the sea shore in May and June.

39. *Ereunetes mauri.* WESTERN SANDPIPER.—Observed in April and May and again in July, often in company with Least Sandpiper.

40. *Totanus melanoleucus.* GREATER YELLOW-LEGS.—Seen occasionally, singly or in pairs, on the sea shore throughout the period of my visit.

41. *Heterocelus incanus.* WANDERING TATLER.—Seen almost daily on the rocky shores usually single birds, but occasionally pairs.

42. *Actitis macularia.* SPOTTED SANDPIPER.—Seen on the sea shore, not common.

43. *Numenius hudsonicus.* HUDSONIAN CURLEW.—Seen almost daily on sandy beaches, in small flocks, the largest flock seen containing eleven birds.

44. *Squatarola squatarola.* BLACK-BELLIED PLOVER.—Seen frequently on the sandy beaches, often in pairs. Like the Hudsonian Curlews, these, no doubt, are non-breeding birds.

45. *Charadrius semipalmata.* SEMIPALMATED PLOVER.—There is one breeding colony of this little plover on the shore of Graham Island. This is probably the most southerly breeding place of the species on the Pacific coast.

46. *Aphriza virgata.* SURF-BIRD.—Seen in flocks on the rocky coast in April and first week in May, often in company with Black Turnstones. Not seen later.

47. *Arenaria melanocephala.* BLACK TURNSTONE.—Observed in flocks on rocky shores, often in company with Surf-birds, during the latter part of April and first week in May.

48. *Haematopus bachmani.* BLACK OYSTER-CATCHER.—Found all along the coast, being especially abundant on the west coast of Graham Island, where many nests were seen.

49. *Dendragopus obscurus fuliginosus.* SOOTY GROUSE.—Very common on Graham Island. It has been almost exterminated on Langara Island by domestic cats.

50. *Accipiter velox.* SHARP-SHINNED HAWK.—Not common. A few were observed hunting small birds on the shores.

51. *Astur atricapillus striatulus.* WESTERN GOSHAWK.—Observed almost daily on the coast. All seen were in immature plumage.

52. *Haliaeetus leucocephalus leucocephalus.* BALD EAGLE.—Abundant. About 100 occupied nests of the species were seen. The Bald Eagle finds abundance of food here in the numerous cod, dogfish and skates caught by the halibut fishermen and thrown overboard.

53. *Falco peregrinus pealei.* PEALE'S FALCON.—Common along the coast, twenty-five eyries were found.

These falcons prey entirely on the smaller sea-birds, Cassin's Auklets, Marbled Murrelets and Ancient Murrelets, and an occasional California Murre, being those preyed on. One eyrie of the falcon was situated in the midst of a large nesting colony of Tufted Puffins and Violet-green Cormorants. The eyrie, containing 4 well grown young, being within 4 feet of a brooding Cormorant on the same ledge.

54. *Falco columbarius suckleyi.* BLACK MERLIN.—Observed occasionally on the coast-line.

55. *Pandion haliaetus carolineusis.* OSPREY.—Not common, only one pair seen.

56. *Cryptoglaux acadica brooksi.* ISLAND SAW-WHIT OWL.—This little owl is apparently quite common on both Langara and Graham Islands. It was occasionally seen by day in the dense woods, and often heard at night.

Its notes are quite different from those of *acadica.*

57. *Ceryle alcyon caurina.* NORTHWESTERN BELTED KINGFISHER.—Observed along the streams

on Graham Island, also along the coast. Common.

58. *Dryobates villosus picoideus* QUEEN-CHARLOTTE ISLAND WOODPECKER.—I found this wood pecker quite common along the western coast of Graham Island, where a number of nests were found.

It is also quite common on Langara Island, where about 20 nesting pairs were seen.

59. *Sphyrapicus ruber notkensis.* NORTHERN RED-BREASTED SAPSUCKER.—Found abundant on Graham Island, where many nests were seen.

60. *Colaptes cafer saturatior.* NORTHWESTERN FLICKER.—Apparently a rare bird in this region. Only one was seen on some drift-wood on the shore of Langara Island.

61. *Selasphorus rufus.* RUFOUS HUMMINGBIRD.—Very common. First noted on April 29th during snowy weather.

62. *Tyrannus tyrannus.* KINGBIRD.—A rare bird here. Only one seen.

63. *Empidonax trailli trailli.* WESTERN TRAIL'S FLYCATCHER.—Observed in suitable places on Graham Island. Not very common.

64. *Cyanocitta stelleri carlottae.* QUEEN CHARLOTTE JAY.—Very common on both Graham and Langara Islands.

65. *Corvus brachyrhynchos caurinus.* NORTHWESTERN CROW.—Abundant along the coast. Many nests were found, all built on the ground beneath bushes or windfalls close to sea shore.

66. *Corvus corax principalis.* RAVEN.—Common along the coast. This is the first bird to nest on the coast, the eggs being laid about March 15th.

67. *Pinicola enucleator carlottae.* QUEEN CHARLOTTE PINE GROSBEAK.—Observed on Graham Island where I found a nest with well grown young, June 7th. Not very common.

68. *Loxia curvirostra minor.* AMERICAN CROSSBILL.—Observed in flocks, both on Graham and Langara Islands.

69. *Astragalinus tristis salicamans.* WILLOW GOLDFINCH.—The only place I observed this species was in the vicinity of Massett, where it was apparently breeding, in the fruit trees. The Goldfinch has followed the settler along the coast.

70. *Spinus pinus.* PINE SISKIN.—Abundant both on Graham and Langara Islands. Nesting.

71. *Calcarius lapponicus alascensis.* ALASKAN LONGSPUR.—One specimen was seen on a muskeg on Langara Island, April 23rd.

72. *Passerculus sandwichensis sandwichensis.* ALEUTIAN SAVANNAH SPARROW.—Abundant on migration, April and May.

During that time they were seen in numbers daily on the drift wood on the shores.

73. *Zonotrichia leucophrys nuttalli.* NUTTALL'S SPARROW.—Abundant on migration during the last week in April and early in May.

Apparently does not breed here.

74. *Junco hyemalis oreganus.* OREGON JUNCO.—Common. I found it nesting on the muskegs on both Graham and Langara Islands.

75. *Melospiza melodia rufina.* SOOTY SONG SPARROW.—This large Song Sparrow is abundant along the coast and many nests were found. The nests and eggs are larger than those of our other Song Sparrows.

76. *Passerella iliaca townsendi.* TOWNSEND'S FOX SPARROW.—Abundant along the coasts of both Graham and Langara Islands. Many nests of this sparrow were found.

77. *Zonotrichia coronata.* GOLDEN-CROWNED SPARROW.—A few were observed on migration the last week in April.

78. *Melospiza lincolni striata.* FORBUSH'S SPARROW.—Observed on the coast on migration from the middle of April to middle of May. Observed in June on the muskegs of the interior of Graham Island where it is undoubtedly breeding.

79. *Hirundo erythrogastra.* BARN SWALLOW.—Nests at the Lighthouse at Langara Point. Common in vicinity of Massett.

80. *Iridoprocne bicolor.* TREE SWALLOW.—Common. I found it very common on the west coast of Graham Island, nesting in abandoned woodpecker's borings in dead trees.

81. *Vermivora celata lutescens.* LUTESCENT WARBLER.—Observed in the clearings in vicinity of Massett. Not common.

82. *Wilsonia pusilla pileolata.* PILEOLATED WARBLER.—Common on both Graham and Langara Islands.

A nest was found on June 7th containing 4 newly hatched young.

83. *Nannus hiemalis pacificus.* WESTERN WINTER WREN.—Very common. Found in the woods everywhere. Many nests found.

84. *Certhia familiaris occidentalis.* CALIFORNIA CREEPER.—I found this bird quite common in the large timber in vicinity of Massett, Graham Island. Also observed on Langara Island.

85. *Sitta canadensis.* RED-BREASTED NUTHATCH.—Seen on both Graham and Langara Islands, but not common.

86. *Penthestes rufescens rufescens.* CHESTNUT-BACKED CHICKADEE.—Common on both Graham and Langara Islands.

87. *Regulus satrapa olivaceus.* WESTERN GOLDEN-CROWNED KINGLET.—Common on both Graham and Langara Islands. One nest found 80 feet from ground in spruce tree.

88. *Cinclus mexicanus unicolor.* DIPPER.—Seen on most of the streams on the west coast of Graham Island.

89. *Hylocichla guttata.* ALASKAN HERMIT THRUSH.—Found breeding on Langara Island. Two nests found, June 10th, containing feathered young. Both these nests were built on top of stumps, the one 8 feet from ground, the other 6 feet.

90. *Hylocichla ustulata.* RUSSET-BACKED THRUSH.—Abundant everywhere near the coast line. Arriving about May 10th. Many nests seen.

91. *Ixorens naevins meruloides.* NORTHERN VARIED THRUSH.—Abundant both on Graham and Langara Islands. Breeding.

92. *Planesticus migratorius propinquus.* WESTERN ROBIN.—Common along the coast of Graham Island. Rare on Langara Island.

Often observed feeding on Sandhoppers and Marine Snails on the sea-shore.

THE PASSENGER PIGEON IN FOLKLORE

By A. LAROCQUE

FEW men now living can remember the time when Passenger Pigeons were plentiful and fewer are those who have killed or eaten them. In the writer's opinion any fact which relates to these extinct birds should be carefully noted and consigned to print before it is forgotten; and it is with this idea in mind that this note was written.

Some fifty years ago Passenger Pigeons were known as "tourtes" among the French Canadians of the banks of the Ottawa and Gatineau rivers. The writer was curious to know if this name also included the Mourning Dove but was assured that it did not, the latter being called "pigeons suavages".

It has been pointed out to me that Mourning Doves have been known in the Gatineau district for only fifteen years and that moreover they were usually lumped under one name with the Passenger pigeons as the differences between the two were so small as to escape the ordinary observer. My informant did not state definitely that he had seen Mourning Doves in the Gatineau district but merely that they were known to him as "pigeons sauvages" and were quite distinct from "tourtes" the latter going about in flocks and the former in pairs. One must remember also that my informant is a well-travelled man and may have become acquainted with the Mourning Dove while living farther south. Moreover the existence of two distinct French names would point to a differentiation of the two species, so that I consider myself justified in assuming that not only were the *tourtes* Passenger Pigeons but that the *pigeons sauvages* were Mourning Doves.

At that time Passenger Pigeons were a serious pest, swooping down in flocks on grain fields and doing much damage. They were caught in nets (*rets*, pronounced *ra* with a short *a*) and were shipped to Montreal by the barrelful. The net was sprung with a string which was worked from a blind and in this manner pigeons would be caught a hundred at a time.

An old woman, part Indian, used to save the gizzard (*gésier*) when the pigeons were prepared for market and would string them on a thread and hang them up to dry. The gizzards when dry became shiny and transparent and were used by this old woman, who was a sort of medicine-woman, in the treatment of gallstones. The reasoning was as follows: the *tourte* would sometimes take up small stones (*gravois* pronounced *grawa*) instead of grain but that did not matter as its gizzard was strong enough to dissolve the stones. Therefore when the gizzard came in contact with the gall stones it would dissolve them too and cure the patient. My informant did not make it quite clear how the remedy was taken but it is certain that it was taken internally as the gizzard had to come in contact with the stone.

And now we come to the mystery of the disappearance of the Passenger Pigeon. Questioned as to this my informant assured me that this was the way of it: "The depredations were so serious in a parish up the Gatineau that the *curé* decided to invoke the aid of God. He therefore laid a curse (*conjuration*) on the pigeons and from then on their number decreased until now they are no more".

My informant related the above stories in all good faith and I refrained from voicing my scepticism out of respect for his old age and also lest I should arouse his suspicion and stem the flow of his rich store of reminiscence.

The above notes may have very little value as natural history but the writer found them interesting and as such records them. In ten or

twenty years more the men who saw the Passenger Pigeon darken the sky in immense flocks will be gone and unless their knowledge is recorded it will be lost to future generations.

NOTES AND OBSERVATIONS

THE WHISKEY JACK.—The present Winter promises to be of considerable interest to the bird lover. Pine Grosbeaks arrived at London early in November and two of us thought we heard Evening Grosbeaks and on October 25th Mr. and Mrs. T. D. Patterson saw, at close range, a Canada Jay in London. This is the first record of this bird for Middlesex County and will give a pleasurable anticipation to every bird walk during the Winter.—W. E. SAUNDERS.

THE FOOD OF THE GREAT HORNED OWL.—While deploring anything in the nature of a controversy that takes up valuable space I must make a short reply to Mr. Ralph D. Bird's attack on me in the December number of *The Canadian Field-Naturalist.*

He accuses me of basing my information on second hand observations and of blackmailing "one of our most valuable birds".

It is obvious Mr. Bird bases his sweeping statement as to the beneficial qualities of the Horned Owl on his own observations.

Let me quote that recognized authority, Fisher's "Hawks and Owls" to disprove Mr. Bird's contention that this owl's food is mainly mice.

Out of 127 stomachs examined from 29 States and Provinces only 13 contained mice while 31 contained poultry or game birds. My own experience is not second hand but covers nearly half a century spent in various parts of North America within the range of the Horned Owl, from Florida to the Yukon, including study of captive birds and their pelletal reactions.

At the commencement I had no "prejudice" against the bird but as my acquaintance became more intimate I realized what a destructive predator this powerful raptor really was. As any of my friends can attest I ought to know this owl, I can talk it's language and call any owl up to me at almost anytime, day or night. How many of these owls have I killed in all these years? The figure must run into several hundreds and I can simply state that I do not recollect a single mouse in any of all these stomachs examined. True, most of the owls were killed in regions where game was more or less abundant. Take the record for this season as an example, I have shot 7 Horned Owls myself and examined two others; of the 9, 2 contained squirrels, 5 poultry or game birds and two were empty. This is a sample of their diet in British Columbia, except that in the northern regions rabbits would be very much in evidence.

The poultry and game birds taken include birds of the largest size up to Canada Geese and even Swans from parks, both Mute Swans and the very pugnacious Australian Black Swan.

In the south-western States the Horned Owl lives almost exclusively on medium-sized mammals because of the abundance of these. Five taken in January in Merced Co., California, were all full of wood rats (*Neotoma*), not a destructive mammal; none had eaten ground squirrels although these were extraordinarily plentiful.

Lastly it is in order to consider the Horned Owl in relation to other owls; from my own observations I am convinced that in the northern portions of its range the scarcity of small owls is largely due to the Horned Owl. I have taken several species from their stomachs and the imitation of the call of one of the smaller owls will very often bring up a Horned Owl which evidently regards the smaller species as prey. I am not "prejudiced" against any owl but am distinctly "subprejudiced" against the Horned Owl, after very careful consideration, as a destructive predator except in the southern portion of its range.—ALLAN BROOKS.

BOOK REVIEW

THE NATURAL HISTORY OF THE DOUBLE-CRESTED CORMORANT (*Phalacrocorax auritus auritus* (Lesson)). *A Thesis Presented to the Faculty of the Graduate School of Cornell University for the Degree of Doctor of Philosophy, by Harrison Flint Lewis. pp. 94, 2 maps, 2 plates anatomical drawings and 10 photographs. Published under the Auspices of the Province of Quebec Society for the Protection of Birds, Ottawa, Canada. Published Dec. 9, 1929. Price seventy-five cents.*

This attractive brochure of ninety-four large octavo pages adds another to the short list of American species that have been systematically monographed. It is a good job most excellently done, and can well be taken as a model for such work in the future. A bibliography of about two hundred titles accompanied by a note that it is but part of some eight hundred and twenty-two, from Hakluyt and the early voyagers to the present day, that have been considered in the course of the investigation, bears witness to the care and completeness with which literature has been searched. In addition is a great deal of painstaking original research in both field and laboratory.

The presentation is admirable and embraces the following subjects in logical order—Introduction, Taxonomy, History, Present and past range and abundance, Migration, Courtship and mating, Nest and nesting, Eggs, Young, Plumages, Voice, Food and feeding habits, Other activities, Relation to environment, Relation to man, Conclusion and Bibliography. Each is practically exhaustive of present information from all sources. The style is a model of concise, precise but withal easy reading. There is no padding and no rhetoric but a great deal of meat is presented in an attractive form and it is the opposite of dry or didactic.

One is tempted to abstract its contents but there is so much of interest contained that its length would overrun our space and the reader is better advised to consult the original rather than be satisfied with a weak copy. A few points are suggested however that are worthy of particular mention. First, that so unprepossessing or generally regarded repulsive a species should contain so much popular interest. When we break down the walls of traditional prejudice we find all nature attractive. Second, the value that accrues from the mass of scattered fragmentary notes published in various media. These may seem disjointed and futile in their individual details but when gathered together as they have been here they weave into an integral whole of great value. A glance at the bibliographical list of the sources of information is more than a justification of the role that our periodicals of natural history record play in science and the necessity of their continuance and support both in subject matter and finance. Third the fallability of general knowledge and common report. Here is a species that practically all fishermen have unhesitatingly condemned as a salmon and trout destroyer until scarcely a voice could be raised in its defence, yet on investigation proves not only to have a distaste for these particular fish but seemingly a physical intolerance towards them. It is a particularly striking demonstration of the danger of condemning any species on even the best of apparent evidence without a thorough previous investigation.

Perhaps everybody will not find all the chapters equally interesting to their particular taste but this is true of all books that are exhaustive in their scope and there is plenty here to appeal to all classes of readers. The systematist will find some obscurities made plain and some additions to anatomical science. The distributionist will find maps of ranges worked out to his hand and the bird-bander the results of his endeavors applied to a specific question. The behaviourist will receive new light on avian reactions to stimuli and the aesthetic naturalist new beauties in nature. The ecologist will find fresh information on the reaction between environment and an organism and the sportsman and conversationalist much ground for thought.—P.A.T.

Canada North of Fifty-six

By DR. E. M. KINDLE

(*This article won the $1000 prize donated by the late Sir Wm. H. Price*)

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Jack Hornby in 1914

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AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

THE LATE JOHN HORNBY

SCION of the well-known Lancashire family of sportsmen, John Hornby inherited an unsurpassed physical set-up that for twenty-five years enabled him to defy the Far North. Carefree, improvident, and indulgent of the natives, he gloried in his reputation of being able to "out-Indian the Indians". Although many vivid tales of his adventures reached civilization he avoided publicity and eventually became so seclusive that the newspapers commonly referred to him as the "Hermit of the Arctic".

A stern moralist and absolutely fearless of any man, in the North he was esteemed though hardly understood. Slightly ego-centric, he deplored the fact that more official interest was not accorded his activities, and yet invariably failed either to keep a daily journal of his observations or subsequently to prepare a narrative. He believed that it was a greater achievement to risk, meet, and surmount privations and danger than to pass over the same route in comparative comfort. Heedless of the toll it exacted physically he welcomed hardship, and excused his failures the more readily as his sufferings increased.

These eccentricities soon served to dismay those who recognized his exceptional education and abilities, and but for this early impatience Hornby might have been encouraged to adopt the orderliness demanded of those who assume scientific responsibilities. His amazing interest in natural history, strikingly manifest in the field, led him further and further from the outposts of civilization. Although starving and hardly able to stand he would often dig for hours to uncover a rodent, his tools, for the want of anything better, invariably being an axe and gold pan. Later more often than not, this and what other specimens he had collected would be lost in a capsized canoe, in a blown down tent, or through some other misfortune often visited upon the lone traveler.

His death, with his two companions, from starvation in the Thelon River country, which he and I had previously found so alluring, was both tragic and heroic. Old war wounds, years of hardship, and his age at last had their effect. Badly injured as the result of a fall, and suffering intense pain, he persisted in going far afield in search of game, and surreptitiously starved himself that the others might live. Here at last but too late he displayed a generalship that he had never before exercised.

Many will criticize him, will say that his was a vain sacrifice, but John Hornby died a gentleman and died true to the traditions of the Great North which above all else in life he loved.

JAMES C. CRITCHELL-BULLOCK.

Seattle, Washington,
February 10th, 1930.

ITINERARY

A VISIT to the Canadian Northland was suggested originally by my physician in London, when, after a period of three years in hospital and my retirement from the Army, I found life becoming decidedly irksome.

A journey through the Rocky Mountains restored much of my morale, and subsequently, when a hunting trip towards the Columbia Icefield in company with John Hornby failed to kill me, though we endured considerable hardship, I was forced to conclude that my case was hardly as serious as the Medical Boards had been wont to argue.

Towards the end of 1923 an expedition to the Barren Lands was suggested by Hornby, and I agreed to accompany him as photographer. It was hoped to be able to arrange matters on a

large scale, three years to be occupied in the undertaking. At the beginning of 1924 Hornby left for England to complete arrangements, I remaining in Canada to attend to provisioning and equipping.

Unfortunately many difficulties presented themselves in England, the expedition was cancelled by Hornby, and, already equipped, I found the situation somewhat perplexing. Though experienced in tropical undertakings of a similar nature I found myself hopelessly at a loss as to the procedure to be adopted on a trip to the Arctic. For a while I contemplated abandoning everything, and endeavoured to dispose of some of my equipment, but soon discovered that it is far simpler to purchase than it is to sell. Finally I determined to go through with the matter, did much intensive reading, and set about looking for suitable assistants.

By the beginning of June we were ready to start. I sent a cablegram to Hornby asking for permission to use his buildings at the east end of Great Slave Lake, and in reply received notification of his departure for Canada with the request that I should delay my departure pending his arrival.

Arrived, he told me that he had found it possible to absent himself from England for a period not exceeding eighteen months, and that he was willing to accompany me for that period. I was elated; with a man of his experience to assist me I felt that most of my difficulties would disappear.

On June 24th I started out from Edmonton with my two assistants, leaving Hornby to follow as soon as possible. At Waterways we took to the river in canoes, and on July 3rd arrived at Fort Smith. Here we sorted out some three tons of supplies that I had shipped in advance, and purchased a power-driven scow to transport everything to old Fort Reliance.

On August 1st Hornby arrived from Peace River Crossing with four men. They had been much delayed by engine trouble. The past month had been an anxious time for me as I had been able to get no news of Hornby at all, and, as the season was fast advancing, had been on tenterhooks to get moving.

I had already sent my party down river to a place where it would be more easy to procure fish for dog feed, and as soon as I became assured of Hornby's safe arrival put an Evinrude in my canoe and followed hard after, not stopping to sleep for the forty-eight hours that it took to reach the Jean Marie River. I had nineteen hundred pounds of flour and sacked provisions aboard, the weather was bad, and the canoe made heavy weather of it, shipping a quantity of water, but flour sacks must be long submerged before their contents are spoiled, and little more than fifty pounds were lost.

On August 9th Stony Island on Great Slave Lake was reached. It is an interesting little island. Wild fruit grows wherever the bushes that bear it can find sufficient soil. Red currants, cranberries, and gooseberries attain a size and succulence that bear comparison with the best productions of the market gardener. This used to be a great fishing centre, and I imagine that the fish remains scattered everywhere have so manured the ground as to render it extremely fertile. Here we caught five varieties of fish: Inconnus, whitefish, trout, sucker and pike. The Inconnus (*Stenodus mackenzii*) weighed up to eighteen pounds. Whitefish (*Coregonus* sp.) were small, scaling no higher than four pounds. Trout (*Cristivomer namaycush*) up to twelve pounds. Pike (*Esox lucius*) up to ten pounds. One sucker (*Catostomus catostomus*) only was taken.

There are few historical notes concerning the island that are worth mention, merely that Franklin breakfasted here when on his way to Enterprise during the expedition on which the entire party almost paid the extreme penalty. Frank Delorme a half-breed Indian camped there told me that fifty years or so ago it was possible to pass through the centre of the island by canoe. The centre now however stands at a height of several feet above the surface of the surrounding lake. In the undergrowth there is a little grave, evidently many years old and buried there lies an Indian child killed by dogs, an occurrence that is not uncommon in a country where cruelty to animals is an amusement.

On August 13th the arrival of the remainder of the party gave us hope and the same day we set out for Fort Reliance, two hundred and twenty miles distant. Heavy weather caused considerable delay and not a little anxiety for the safety of our provisions, and we did not arrive until August 29th.

We camped immediately opposite the ruins of Sir George Back's old winter quarters. It is a beautiful place and worthy of preservation. Numerous travellers responsible for the exploration of the country have had their camps here, but nomadic Indians, trappers, and prospectors have used nearly all the material that remains to denote the Fort site that served as the base for historic exploration. Tyrrell has called it the most beautiful townsite in all Canada. Though this may be a slight exaggeration there is little doubt that it could hardly be excelled in all Canada north of the Provincial boundary. But

the fine timber all about is fast disappearing, the great trading companies will soon have opposition establishments cut into the forest, the ground will be littered with refuse, and the starving dogs of the post Indians will prowl through the woods killing and driving off all the game.

The site of Back's old fort at least should be preserved. History counts for much.

As my health returned and I appreciated that the agency at work was the combination of nature's food with unlimited exercise in a pure atmosphere, I commenced to speculate as to the future of this pleasant spot. I remembered the countless numbers of men I had seen suffering from tropical diseases, cases diagnosed so often as hopeless. Men doomed to go through life suffering relapse after relapse, with life more often than not a veritable curse to them, themselves eventually to become a curse to all those associated with them.

I pictured the place as a great sanitorium, to which men with hope could come, and in a year leave with all their one-time strength and health. I fancied I saw a great caribou ranch on Artillery Lake, the barren lands about it their summer home, the edge of the timber the natural retreat of the bulls in winter. The patients living in shacks about Charlton harbour, leading men's lives, assisting with the herding, fishing and living off the superb flesh of the early Fall bulls. A great industry, yet running sweetly because of the leavening touch of philanthropic endeavour concerned with it. White fox farms would come into their own, the torture of the steel trap, so unenviably associated with such a pleasant district, could be prohibited, and the Indians within the sphere of activities could be induced to lead a life of less ambiguity.

On September 2nd all the supplies that we did not require were placed en cache opposite the old Fort, and sufficient to last us for two months made ready for transporting across the portage route to Artillery Lake.

On September 3rd G. H. Blanchet of the Topographical Survey arrived in his schooner and anchored opposite, in company with his assistant W. Macdonald of the University of Alberta. Although late ice on Great Slave Lake had prevented him from reaching his first objective until well into the summer, he had succeeded in traversing a great tract of partly-explored and unexplored territory. His investigations have led to the entire lake system north of Great Slave Lake, including Artillery Lake, Clinton-Golden, Aylmer, Mackay, and Lac de Gras, being greatly revised on our maps.

The following day he transported us and our effects to the commencement of Pike's Portage, where he met the rest of his party returning from the north.

That evening we started across the portage having five canoes and each six hundred pounds of provisions. Messrs. Loranger and Roberts, the official wolf poisoners, visited us and brought us the acceptable gift of some fine fat trout.

Artillery Lake was reached on the 12th, bad north-easterly rain storms having contributed a good deal to our discomfort and delay on the portages.

The following day we met with the first caribou and I succeeded in shooting a fine young bull. It was urgently required as we had been put to some difficulty in procuring sufficient food to feed the dogs without being forced to utilize our own supplies. The horns were still in velvet, and the animal, a four-year-old, dressed down to about 140 pounds; we managed to strip off a few pounds of back-fat from beneath the rump hide, but as yet, of course, the caribou had not attained their best condition. Caribou were now to be seen roaming about, grazing, in ones and twos. Mostly bulls and so scattered about the country that from a high hill but one or two pairs could be observed. But from now onwards little difficulty was experienced in securing all the fresh meat we required. In order to work off the effects of salt pork and bacon, on which I had been living for the past three months rather too well, I confined my diet almost entirely to "straight" caribou meat, being much comforted in consequence. Heel galls that had persistently troubled me by not healing almost immediately dried up and grew whole.

The passage of Artillery Lake was exceedingly slow. We failed to propitiate the wrath of the spirit that has Beaver Lodge on the Western shore for its place of abode, and in consequence were assailed by fierce gales from the north-east and south-west, being twice held up for six days. The temperature was dropping, snow, sleet, and hail were the order of the day, all the boulders and rocky points became ice-covered, the seas ran high and even on the finer days canoe travel was apt to be somewhat hazardous. On more than one occasion seas were shipped and hurried landings had to be made. Though the lake is quite narrow we found that the water during a gale would become piled up on the weather shore to a considerable height, and during one night in particular it necessitated thrice removing our entire belongings in all fifty feet further inland.

On September 28th the smaller lakes were

firmly iced and hard enough to travel on. For hauling meat, dogs and sleighs were put into commission, steel runners being used for passages over bare ground.

On September 29th the northern extremity of the lake was reached. The last of the timber had been left twenty miles behind, but on the esker that runs across the head of the Lake some small scrub spruce was discovered; with its use we decided a dug-out could be constructed, however, and as we were prepared already to resign ourselves to any conditions in order to pass a winter in the Barren Lands, a site was chosen. One man neverthless decided that the edge of the timber offered better prospects and he retreated thither.

The Peace River party now commenced to build themselves their winter home, but Hornby decided that the locality could not hold us all, on account of the lack of fuel. Hence we decided to travel further north. The building under construction had sand for its foundations, and into this a hole twelve feet by twelve was dug to a depth of about three feet. Tundra sedge for sods was scarce but boulders were not, and the walls were revetted and built up with suitable ones chosen from the bed of a creek nearby. A ridge pole was happily secured for the roof, canvasses and caribou hides were stretched across it, moss and earth placed on top and within a few days a habitable but inartistic residence had gone into erection. Snow had commenced to fall so the procuration of winter fuel had to be considered. In favoured localities on the sand of the esker dead and dying scrub spruce was to be found within a radius of five miles. Most of this grew in creeper form with long twisted roots beneath the sand. During many years a gradual change in the direction of the prevailing wind had, apparently, rendered the locality once favourable for the growth of this hardy tree unfavourable; they have died off, and the sand blown clear of the roots, leaves patches of dry timber in view. This it was that served to provide sufficient fuel for that party for almost the entire winter. At first glance one or two were distinctly sceptical with regards the quantity of fuel to be gleaned, and on many occasions during the winter it was held that no more could anywhere be procured. Eventually however, the supply in hand would fall off, and rather than make the twenty-mile trip to the last woods another search along the esker would be made. Another load would always be forthcoming, though it must be admitted that after a few weeks stuff was being burnt that few would ever recognize as possessing combustible properties. Fox grease often had to be used to help it out.

On October 11th Hornby and I selected a building site about ten miles north-west of this point, on the bank of Casba River near the eastern terminal of the esker. There was practically no fuel, but there were a dozen spruce poles about eight feet high that could be employed for dug-out construction. In any case it appeared to be the only remaining place so we determined to make the best of it. A similar house was made though smaller (10 feet by 7 feet), and built well beneath the sand, the walls being the revetted sides of the hole in the sand. A trench twelve feet long and seven feet deep was cut to the entrance, and covered with blocks of snow brought from the few solid drifts that could be found close to camp. Later during the winter considerable anxiety was experienced owing to the subsiding of the walls of this building. Many hard days were spent in the search for suitable poles with which to reinforce it and several hundred feet of tracking line were used to "tie the walls out".

During the long winter much travelling was done, principally in search of wood. It was never possible to load more than three days fuel on to a dog sleigh because of the twisted nature of the wood. Again rarely could more than three days' fuel be collected from one "sprucery". Then possibly it would take four or five days to locate another from beneath its heavy covering of snow. Often during the most bitter weather the perspiration would pour from us as we laboured to hack the twisted roots from the frozen sand and from beneath the snow. Even in the most violent storms the necessity of procuring wood would arise, and it was on those occasions that the greatest difficulty would be experienced as drifting snow would completely obliterate a view of the country-side at any distance greater than a few feet, limiting the range of vision necessary to enable one to discover the commodity.

The constant use of the dogs in search of fuel prevented us from making trips to our base at Fort Reliance for provisions, and the shortage of white man's food, thereby entailed, necessitated much caribou hunting. The human being will consume a large quantity of meat if he is dependent on it solely for his sustenance, and the same applies to dogs. During Inspector French's patrol to Bathurst Inlet in 1918, his teams of dogs, amounting to 27, and his party, used 16 caribou in six weeks for food. In the Spring the caribou are easy to approach, but during the cold weather of winter they are very difficult to stalk. This entailed greater limitation of our

activities, and no doubt the fatigue entailed by constant hunting, poor living and fuel getting, and the periods of shortage of provisions contributed largely to the small reserve of strength we possessed when, during the subsequent trip to Hudson Bay next Spring, we suffered considerably from weakness.

Hornby devoted a certain amount of time to trapping, but the conditions under which we lived in our dug-out were such that many of the pelts were found to have so deteriorated on reaching civilization as to be worthless. This was due to the fact that candles ran out, wolf and fox fat had to be used instead, and the light so provided was so poor as to render careful cleaning impossible. During the summer's heat the grease ran, "boiled" into the hide and loosened the fur.

On October 25th Artillery Lake froze over, and on the 26th Casba River also, except at the swift places, which did not freeze until January 9th.

High winds and persistent low temperatures are the rule during winter away from the woods. On one occasion when I did return to the forest I was particularly struck by the seeming immediate rise in temperature the moment cover was gained. Actually it is not the case, but the combination of high winds and extremely low temperature as found in the interior away from the sea, is particularly noticeable on the treeless plains. Probably the lowest temperature record in North America would be registered near where we were established.

Towards December it was found possible to make a hurried journey to the base for supplies and Hornby made the trip. A considerable quantity of food stuffs was brought north, but all along the route as far as the timber's edge destitute Indians were found, and the call on our provisions became so great that not a large supply reached our camp.

During this journey Hornby was informed by an Indian by the name of Sousie Benjamin, a man who had accompanied Hanbury on his Thelon River trip, that a patch of timber stood isolated at the bottom of a deep bay out of Casba Lake about twelve miles north-west of our camp. This we eventually discovered, though not without considerable difficulty, as it had been practically covered with drift snow. There was quite a little wood, about a dozen or fifteen white spruce trees standing as high as twenty-five feet. The butt of the largest tree, a dead one, measured 71 inches in circumference. They were growing in a deep gully on the edge of a small lake. A stream evidently flows down this gully during the warm weather. When we arrived most of the trees were badly drifted up, probably as deep as twelve feet. It took us several days to find this timber, and it was not until we were right above it on the ridge that the place was found.

Here we established another camp, using a tent, and windbreaking it with snow blocks. Hither we used to repair if caught out during blizzards.

Fuel ran low towards the end of the winter about the esker where the first party established and a return was made by them to the last woods, where a large shack had been built in case this should occur. M. Stewart, however, succeeded in remaining at his post in the Plains practically throughout the entire winter. He was well looked after and provisioned by the remainder of his party in the last woods, and they were rewarded with a large catch of white foxes.

In April I returned to Fort Reliance, settled up with my party that had been left there, disposed of what provisions I could to trappers in the vicinity, left the remainder en cache, and set out northwards again with six weeks' supplies and additions to my photographaphical and collecting outfits.

At the beginning of this month a patrol of the Royal Canadian Mounted Police arrived under Corporal Hawkins and Constable Baker. Inspector Fletcher of Fort Smith kindly arranged the patrol and had our mail sent out with it. The day they arrived was an interesting one for them—they saw their first wolves, which were particularly numerous just then, shot their first caribou, and took back with them two live female white foxes that Hornby gave them. They were somewhat amazed to find the conditions under which we had lived throughout the winter, but nevertheless could not refrain from admitting that notwithstanding we looked remarkably fit.

On April 25th the entire party, except for Hornby and myself, left for Fort Smith.

On May 13th Hornby and I, with eleven hundred pounds of stuff, including two canoes, left Casba River for the Thelon. We had only three dogs and one sleigh, but conditons are almost invariably such in this district that practically any load can be transported across country on steel-shod sleighs at this time of the year. The snow thaws slightly during the day time, and freezes again during the night. This renders night travel a comparatively simple matter. The snow crust is as hard and slippery almost as ice, and provided initial impetus can be lent the sleigh to start with, little difficulty will be experienced in keeping it on the move. Within a week we hoped to be able to reach the valley of the Thelon to await there the disruption of the ice, and spend

a month observing and photographing wild life.

The first day, however, brought with it a northwesterly blizzard, and the country was soon covered with dry sandy snow, making the hauling of such a heavy load impossible. Adverse conditions continued until June 8th, when after tremendous exertions we managed to reach Campbell Lake. For almost a month we had travelled sixteen hours a night, double and treble tripping our load. Snow conditions were never perfect; either it did not freeze sufficiently during the night, or, when it did, snow came and covered the crust with a few inches of drift that made going with such a small team practically impossible. On occasions fifty miles would be covered to move the entire outfit ten miles. Eventually the lakes became covered with water, the snow thawed from off the plains and we had to resign ourselves to waiting until the Hanbury River canoe-route opened up.

Hanbury River is a rough stream, to pass down which much portaging is necessary. It was this portaging that we had hoped to avoid, principally because it would mean wasting so much precious time. In any case our outfit could not be moved over a portage in less than sixteen separate packs. Moreover we had taken only a month's provisions with us.

By the time the river opened we had no food left, were a month behind scheduled time, faced with the necessity of living off the country, and the probability of missing the last means of transportation to civilization.

On July 22nd the Thelon River was reached. Scarcity of nutritious food had caused us to kill off two of our dogs, the straight fish diet, the myriads of mosquitoes and sand flies that attacked us the more because of our weakened condition, the heavy work on the portages, the average five hours sleep a day and our constant anxiety exhausted us considerably. Moreover I had had the misfortune to injure myself and developed acute sciatica.

We were now in the heart of the musk-ox country, nineteen being observed during 19th and 20th July. As the kinematography of these interesting animals was a matter of primary importance we were most anxious to secure the meat that would put us in condition to enable us to follow them and obtain the desired records. Fish on the upper Thelon is most difficult to procure, there being hardly any suitable fishing places. Moreover as the human being requires ten to fifteen pounds a day of fat fish to provide him with any energy at all, the situation under such circumstances presents difficulties. We were commencing to feel some anxiety on this score, when the caribou migration suddenly put in an appearance. For three days they passed in thousands. Four were shot and feasting commenced. We hoped to be able to dry a considerable quantity of the meat, but wood was nowhere close to the scene of our hunt, the blow flies were innumerable, the rain poured and within three days the sun had rendered our supply rotten. Ten pounds a day of straight meat is apt to upset even the strongest stomach if putrid, and for us in our weakened condition it had a distressing effect.

On July 27th, however, more musk-oxen were met with, discomforts were immediately forgotten and valuable photographs were obtained. Unfortunately, whereas it had been hoped to remain in this district fully a month, it was now, on account of our unforeseen delay, impossible to stay longer than two days. Careful and extended photographic work was out of the question, and much of that done was as we drifted down-stream in our canoes. Had it but been possible to devote a week to photography several thousand feet of entirely new and original material could have been secured. But even so several hundred feet of film was brought out, depicting briefly but accurately the movements of the caribou, and the musk-oxen in their natural habitat, subjects that had hitherto never been recorded kinematographically.

On 4th August the last of these imposing animals was seen, and only remained to reach the coast with as little delay as possible.

Although we were in great need of more substantial food the orders we had received forbidding us to kill musk-oxen under any circumstances deterred us from interpreting the spirit rather than the letter of the law. We suffered in consequence. The caribou were in wretched condition, and although on one occasion we rendered down an entire carcass, head included, not a single drop of fat was yielded to us. Kept on the move day and night by pestiferous insects, these poor animals become so lean and out of condition as to be almost uneatable. In order to keep the meat it was necessary to boil it. If the soup was left with the meat in the pot, it would quickly ferment and cause us increased abdominal discomfort. Hence whenever a big supply was cooked the essence would have to be poured off. The flesh remaining could only be likened to grass, and by the time Beverly Lake was reached we hardly had the strength to put up our mosquito bars and collect enough fuel to boil the kettle.

On 14th August we sighted Eskimos—four families. They were camped on the western end

of Aberdeen Lake, and were the first human beings we had seen. They were poor, but we managed to secure two good caribou tongues from them, and the same evening at a place a few miles below their camp good whitefish fishing was found. This helped considerably. On leaving this place bad luck was again encountered, neither caribou nor sufficient fish could be procured, and the last dog was shot. One evening owing to weakness I allowed my axe to slip and cut my right foot very badly. The situation was at last showing signs of becoming critical. But on August 22nd Hornby had the good fortune to shoot a fine young bull caribou. It was in fair condition and putting on fat. That night we feasted.

On August 24th a heavy rapid on the lower Thelon and Dubawnt was found and this necessitated a portage of a mile.

On August 27th Baker Lake was reached. The last part of the river where it enters this lake is dangerous. The channel is full of shoals, the water is swift, and in places broken. Coming down-stream the rapid is not seen until one is in the middle of it. This nearly occasioned the loss of a large part of our outfit.

On September 6th Chesterfield Inlet Post was reached, and passage to Port Harrison on the other side of Hudson Bay was secured through Messrs. Revillon Freres.

Here passage to Newfoundland was procured in a steamer chartered by the Hudson's Bay Company to replace their S.S. *Bay Eskimo* which had been sunk early in the year.

(To be continued)

NEW RECORDS OF MASTODONS AND MAMMOTHS IN CANADA

By C. M. STERNBERG, Geological Survey of Canada[1]

MODERN elephants inhabit only the warmer regions of the world but fossil remains of their ancestors, (see Plate I), the mastodons and mammoths, have been found in Pleistocene deposits in nearly all parts of the habitable world except Australia. They have been found, in North America, from Florida to California and from Mexico to Yukon and Alaska.

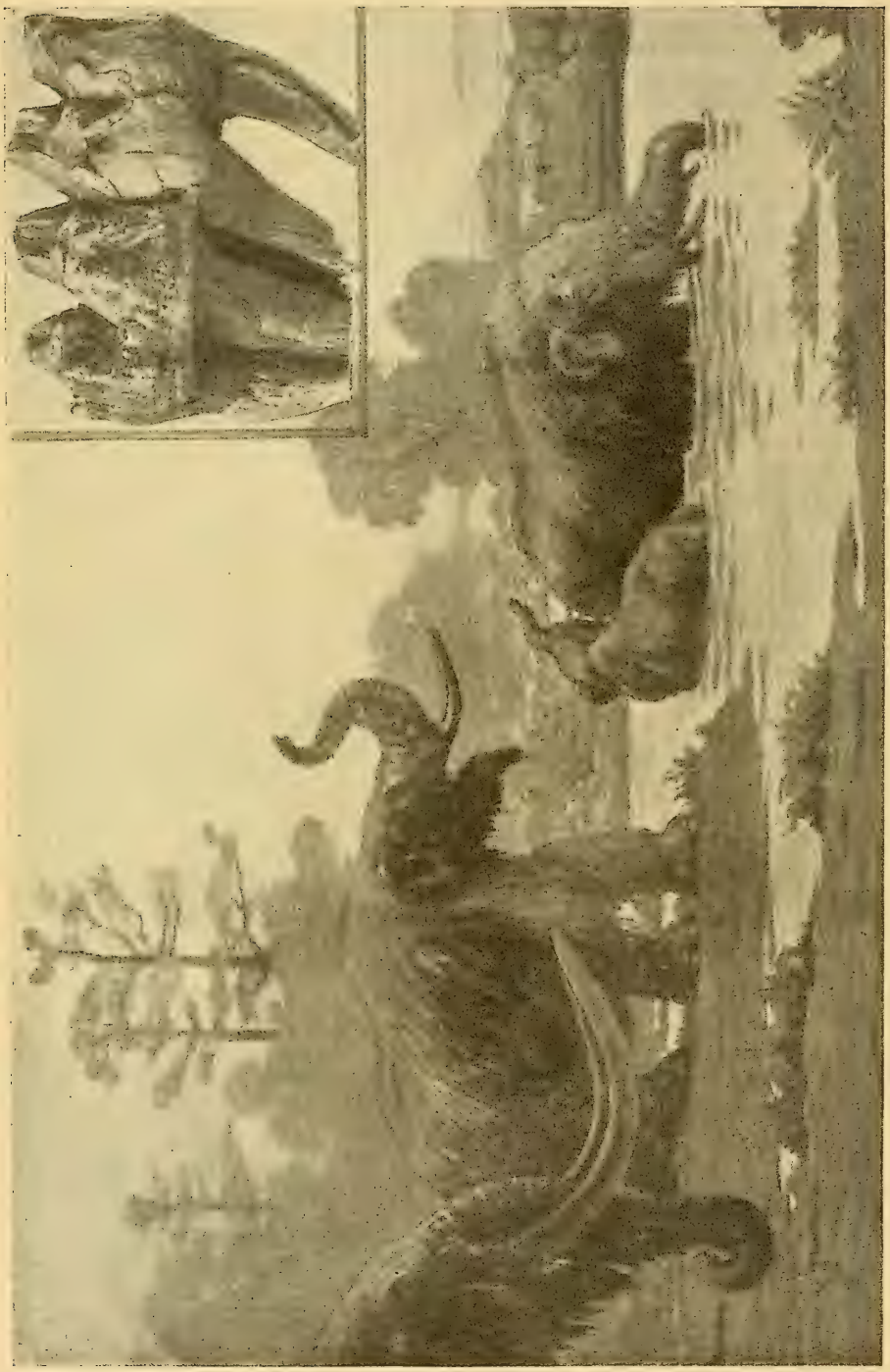
Among the first vertebrate fossils to be found in North America were the remains of mastodons and mammoths and as early as 1705 a mastodon tooth was collected from the Hudson river valley near Albany, N.Y. This tooth was sold for a gill of rum but was later presented to Lord Carnbury who sent it to England as the tooth of a giant man. To those early collectors the finding of mastodon teeth confirmed their belief that there were giants in the antediluvian world and reports were written describing their probable size and habits.[2]

The mastodon about equaled the Indian elephant in bulk but was not so tall, its limbs being shorter and its body broader. They were forest-dwellers and their teeth were well adapted for browsing. The tusks, which are modified incisor teeth, were larger than in the modern elephants and in some specimens there are vestigial tusks in the lower jaws. In the Tertiary mastodons inferior tusks were common and often quite large. In the mastodons and mammoths, as well as the modern elephants, there were no canine or premolar teeth but the milk molars served as premolars. There was no vertical succession of the cheek teeth but the new ones developed behind those in use which, as they were worn, were pushed forward and finally shed. There were only six cheek teeth in all, on each side, and in young individuals as many as three, on each side of the jaw, were in use at one time, but in very old individuals only one remained unshed. The cheek teeth of the American mastodon were relatively low-crowned and made up of two to five prominent transverse ridges, covered with thick enamel and, usually, with no cement on the crown. These differed greatly from the teeth of modern elephants and the mammoths, which are high-crowned and made up of a large number of vertical plates of dentine covered with enamel, the spaces between filled with cement and the whole tooth covered with a thick coat of cement. As the tooth wears the dentine and cement wears faster than the hard enamel and thus the narrow edge of enamel stands up to a higher level and serves as a grinding mill.

Though mastodon fossils have been found in the Yukon they are not as common, in this more northerly region or in the glacial deposits, as are the remains of the hairy mammoth (*Elephas primigenius*). This is explained by the fact

[1]Published with permission of the Director of the Geological Survey of Canada, Ottawa.

[2]See The Mastodons, Mammoths and Other Pleistocene Mammals of New York State, by Hartnagle and Bishop, New York State Museum Bulletin 241, 1921; pp. 20 and 26.



By courtesy American Museum of Natural History.

RESTORATION OF THE AMERICAN MASTODON.

INSET: MOLAR TOOTH, ⅓ ACTUAL SIZE.

that the mastodon, though not a hot-country animal, was not adapted for the extreme cold as was the hairy mammoth. The mastodon was covered with a moderately thick coat of shaggy hair whereas the hairy mammoth had a heavy coat of long, coarse, black hair and a thick, brown, wool-like, under-coat. The hairy mammoth was as well adapted for life in the "Frozen North" as is the musk-ox of to-day. Cadavers of the hairy mammoth have been found frozen in the glaciers and soil of Siberia and, in some cases, were so well preserved that the flesh was eaten by dogs and even men. They were about the size of the Indian elephant. Some students of the mammoth, believe that they have not been extinct much over a thousand years while others believe that it is several thousand years since their extermination.

Mastodon remains are the most numerous of all terrestrial vertebrate fossils reported from the lower lands in the vicinity of the Great Lakes and the Hudson river valley. Most of these have been found in peat bogs or in marl or clay deposits. It is most likely that, in many cases, the animal bogged down while in search of food. At the Bigbone Lick in Boon County, Kentucky, an almost incredible number of teeth, skulls and other bones of mastodons as well as those of mammoths, have been collected. The teeth of mastodons and mammoths are the hardest part of the animal's anatomy and these are often the only parts saved by the amateur collector. In some mastodon specimens what is regarded as the stomach contents have been found within the body cavity. These masses consist of partly digested grass, leaves, and twigs up to half an inch in diameter and two inches in length.

Remains of the hairy mammoth are usually found on glacial deposits but they have been found as far south as North Carolina. This section of the country was probably quite cool at the time of the extreme advance of the ice, during the Pleistocene period, but as the ice retreated the mammoths migrated farther north. The most northerly record of the mammoth, in North America, is that of a tusk from Lidden gulf, Melville island, in 75° north latitude.

Remains of the Columbian elephant (*Elephas columbi*), which was larger than the hairy mammoth, are commonly found in the southern and western United States and teeth of this species have been found as far north as the Yukon.

A third species of elephant, or mammoth (*Elephas imperator*) which inhabited North America during Pleistocene times, is found in the southern Great Plains but, apparently, did not come as far north as Canada. This species was the largest of the lot and equaled or surpassed in size, the largest African elephant.

In the collections of the Geological Survey and the National Museum of Canada are a number of fossil remains of mastodons, including a fine skull, from the following counties of southern Ontario: Wentworth, Oxford, Norfolk, Elgin, and Essex. Besides the writer has records of mastodon finds from York, Dufferin, Lincoln, Welland, Haldiman and Middlesex counties, Ontario. It will, therefore, be noted that mastodon fossils have been found in all the counties bordering on Lake Erie as well as several others.

The writer has no positive records of *Mastodon* from the Canadian prairies.

Fossil remains of the hairy mammoth are not so common, in southern Ontario, as those of the mastodon, but are relatively abundant in western and northwestern Canada. Four counties, in southern Ontario, however, have yielded remains of the mammoth, i.e., Dufferin, York, Wentworth and Kent.

The National Museum of Canada has recently acquired a lower, right, third molar tooth of the American mastodon (*Mastodon americanus*) which was collected in southern Ontario. The specimen was sent in by Mr. A. Conway, of Cedar Springs, Ontario, who states that it was plowed up in low, heavy, land on the farm of Mr. Dan MacIntire, one mile north and two miles west of Dutton, Elgin County. See inset, Plate I.

The tooth is $6\frac{3}{4}$ inches long and $3\frac{5}{8}$ inches broad, and has four cross crests or cusps. It was somewhat injured at or since the time of collection but it is important as giving one more to the many records of mastodon fossils from southern Ontario.

The writer has secured a number of previously unpublished records, of mastodon and mammoth finds in Canada, through the courtesy of Dr. J. A. Allan, Univ. of Alta., Edmonton; Dr. F. H. Edwards, Univ. of Sask., Saskatoon; Dr. R. W. Kirkby, Ft. Qu'Appelle Sanatorium, Ft. Qu'Appelle Sask.; Dr. W. T. MacClement, Queen's Univ., Kingston, Ont.; Mr. T. P. O. Menzies, City Mus., Vancouver, B.C.; Mr. W. A. Newcombe, Prov. Mus., Victoria, B.C.; Dr. R. B. Orr, Prov. Mus., Toronto, Ont.; Dr. W. A. Parks, Roy. Ont. Mus. of Pal., Toronto, Ont.; Mr. N. B. Sanson, Government Mus., Banff, Alta. and Dr. A. Willey, Peter Redpath Mus., Montreal, P.Q. Dr. O. P. Hay in his very fine work, "Pleistocene of North America and Its Vertebrated Animals", Carnegie Institute of Washington, Pub. 322–1923, 322A–1924 and 322B–1927 has recorded a number of mastodon and mammoth finds in Canada and these will not be repeated here. The object of the present article is to re-

Map showing distribution

cord recent discoveries of mastodon and mammoth fossils, and those not recorded by Hay, and thus make the records as complete as possible. No doubt there are other records which have been overlooked by the writer.

So many specimens of these genera, especially *Elephas primigenius*, have been collected from Yukon and Alaska, that there would not be room, in this article, to record them all and so they are omitted. Suffice it to say that practically all of the larger museums in Canada and the United States have specimens from this region. Many of these finds have been made, in the frozen muck and gravel, through the placer mine operations. There are sixty-two specimens of mammoth and four of mastodon, from this northerly region, in the collections of the Geological Survey and National Museum of Canada.

Plate I shows a restoration of the American mastodon and a mastodon tooth. (No. 8541).

Plate II is a map showing mastodon and mammoth distribution in Canada other than the Maritime Provinces and the Yukon.

Following is a tabulated list of mastodon and mammoth finds in Canada other than those from the Yukon, and those reported by Hay.

Mastodon americanus in Ontario.

Parts discovered	Locality and mode of occurrence	Collected or reported by	In possession of
Part of skeleton	Near Shelburne, Dufferin Co.	Mr. J. A. Jelly	Provincial Museum, Toronto.
Most of skeleton	Postglacial; Welland Co.		Royal Ontario Museum, Toronto.
Not stated	Near Smithville, Lincoln Co.	Toronto Globe, Nov. 17, 1911.	Not stated
Not stated	Near St. Thomas, Elgin Co.	Toronto Globe, Nov. 17, 1911.	Not stated

Parts discovered	Locality and mode of occurrence	Collected or reported by	In possession of
Not stated	Near Belmont, Middlesex Co.	Toronto Globe, Nov. 17, 1911.	Not stated.
Two tusks, teeth, and parts of skeleton	Haldimand Co.	S. W. Howard, reported by M. Y. Williams.	S. W. Howard, Hagersville, Ont.
Molar tooth	Norfolk Co.	Simcoe Reformer, Sept. 6, 1923.	Dr. W. A. McIntosh
Five teeth and tusk	A. R. Martin's farm, 5 miles E. of Woodstock, Oxford Co., in peat bog.	A. R. Martin	A. R. Martin, Delhi, Ont.
Considerable part of skeleton	G. Grumble's farm, 5 mi. E. of Woodstock, Oxford Co., in peat bog.	Collected, 1871.	Geological Survey of Canada, No. 6788.
Part of skeleton	Carter Lake swamp, Oxford Co.	Amos Carter	
Skull, with teeth and part of skeleton	W. Jones' farm, Delaware township, Middlesex Co.	Prof. A. D. Robertson	Univ. of Western Ont., London, Ont.
	Pleistocene; Lambton Co.		Royal Ontario Museum, Toronto.
L. R. 3rd molar	Plowed up on farm of D. MacIntire, Dutton Elgin Co.	A. Conway	Geological Survey of Canada, Cat. No. 8541
Teeth and part of skeleton	From slough, 2 mi. north of Shedden, Elgin Co.	W. L. MacKenzie, Quill Lake, Sask.	Univ. of Sask., Saskatoon.
Fragments of teeth	Malahide township, Elgin Co.		Peter Redpath Museum, Montreal
Two teeth	No record, probably Ontario.		Queen's Univ., Kingston, Ont.
Part of tooth	Pleistocene; Dutton, Elgin Co.		Royal Ontario Museum, Toronto.
Tooth	Pleistocene	No information	Royal Ontario Museum, Toronto.
Tooth	Pleistocene	No information	Royal Ontario Museum, Toronto.

Mammoth finds in Canada, other than the Yukon and those reported by Hay.
Elephas primigenius.

Lower jaws and part of skeleton	Near Muirkirk, Kent Co., Ont.	L. M. Lambe	Geological Survey of Canada.
Tooth	Late glacial; West Toronto		Royal Ontario Museum, Toronto.
Fragment of tusk	Pleistocene; Toronto		Royal Ontario Museum, Toronto.
Fragment f tusk	Pleistocene; Toronto		Royal Ontario Museum, Toronto

Parts discovered	Locality and mode of occurrence	Collected or reported by	In possession of
	Pleistocene; Toronto		Royal Ontario Museum, Toronto.
Tusk	Interglacial, Toronto		Royal Ontario Museum, Toronto.
Part of lower jaw and tooth	Coarse gravel, rewash glacial; 1 mi. west of Ft. Qu'Appelle, Sask.	Dr. D. A. Stewart	Ft. Qu'Appelle Sanatorium.
Tooth	Near Edmonton, Alta.	J. E. Revell	Univ. of Alta., No. 14.
Tooth	Near Empress, Alta.	Lawrence Readel	Univ. of Alta., No. 16
Tusk	Herschel Island, N.W.T.	Judge Dubuc	Univ. of Alta., No. 135.
Tooth	Rowley, Alta.	S. W. Thompson	Univ. of Alta., No. 137.
Tooth fragments	Duchess, Alta.	A. I. Meredith	Univ. of Alta., No. 138.
Tooth	Excavation for pier for Peace river bridge, Alta.	Rev. W. Minshaw	Univ. of Alta., No. 139.
Atlas vertebra	Gravel pit, Brule, Alta.	J. McNeil	Univ. of Alta., No. 225.
Ulna	23 mi. N.E. Medicine Hat, Alta., in fluviatile gravels	N. S. Sanderson	Univ. of Alta., No. 229.
Tooth	Gravel bar, Smokey river, ½ mi. above Watino, Alta.	J. Spittal	Univ. of Alta., No. 348.
Tooth	On surface, below glacial drift; 7 mi. S.W. Rowley, Alta.	C. M. Sternberg	Geological Survey of Canada.
2 teeth	In outskirts of Calgary, Alta.	Seen by author	
2 teeth	From Pleistocene gravels; 1 mi. E. of Alderside, Alta	Roy Fowler	Roy Fowler, Alderside, Alta.
Part of tooth	In glacial deposits, South end of Vancouver Island.	Cap. Devereux	Prov. Museum, Victoria, B.C., No. 377.
Part of tooth	In glacial deposits, James Island, Haro Strait, B.C.	J. Neeves	Prov. Museum, Victoria, B.C., No. 296.
Part of tooth	Cordova Bay, V.I.	Justice Drake	Prov. Museum, Victoria, B.C., No. 299.
Tooth	Shuswap Lake, B.C.	Mrs. Dewdney	Prov. Museum, Victoria, B.C., No. 492.
Tusk	Saanich, V.I.	B. H. Lamont	Prov. Museum, Victoria, B.C., No. 484.
Part of tusk	Mt. Tolmie, Victoria District	Mrs. D. Newton	Prov. Museum, Victoria, B.C., No. 485.
Tooth	Sucia Island, Sts. of Georgia		

Mammoth; not specifically identified.

Parts discovered	Locality and mode of occurrence	Collected or reported by	In possession of
2 teeth	Muirkirk, Kent Co., Ont.	L. M. Lambe	Geological Survey of Canada. Nos. 6747 and 6748.
3 teeth and part of skeleton	40 ft. below surface, Burlington Heights, Hamilton, Ont.	R. Benedict	Geological Survey of Canada. Nos. 6770 – 6780.
Mammoth or mastodon	Late glacial; Hamilton, Ont.		Royal Ontario Museum, Toronto.
Mammoth or mastodon	Late glacial; Hamilton, Ont.		Royal Ontario Museum, Toronto.
Mammoth or mastodon	Interglacial; Toronto, Ont.		Royal Ontario Museum, Toronto.
Bones	Post glacial; W. Toronto, Ont.		Royal Ontario Museum, Toronto.
Mammoth or mastodon	Interglacial; Toronto, Ont.		Royal Ontario Museum, Toronto.
Bones	Post glacial; Toronto, Ont.		Royal Ontario Museum, Toronto.
Bones	Pleistocene; Empress, Alta.		Royal Ontario Museum, Toronto.
Bones	Pleistocene; Empress, Alta.		Royal Ontario Museum, Toronto.
Vertebrae and limb	Mouth of Ram Creek, W. of Rocky Mountain House, Alta.	Photographed by D. B. Dowling	Not collected.
Tusk	Little Smoky River, Alta.	C. Pfitzer and S. W. Thompson	Univ. of Alta., Edmonton.
Femur	75 ft. below surface, Empress, Alta.	G. L. Brown	Lent to Rocky Mt. Park Museum, Banff, Alta.
Tooth	Pleistocene; Castor, Alta.	N. B. Sanson	Mrs. Pauls.

GLIMPSES OF LITTLE-KNOWN WESTERN LAKES AND THEIR BIRD LIFE

By J. A. MUNRO

(Concluded from page 45, Vol. XLIV)

TROUT LAKE, DEER LAKE AND BURNABY LAKE, BRITISH COLUMBIA

TROUT LAKE comprises some 10 acres of shallow water, occupying a swampy hollow in a well settled district. The bottom is muddy and the shores are muskeg. At one time good shooting was had at this lake and ducks still frequent the waters when unmolested by hunters. Several American Mergansers, Green-winged Teal and Baldpate were noted on April 5th, 1924.

Deer Lake in Burnaby Municipality is considerably larger, approximately 200 acres. The water is clear and fairly deep, the bottom and shores muddy. Surrounded by deciduous timber growing close to the water's edge, the lake is attractive in appearance and is used to some extent as a summer resort. A small stream

connects this body of water with Burnaby Lake lying at a lower elevation about a mile distant.

Burnaby Lake is approximately three miles long and half a mile wide. The shores are straight muskeg on which grows Labrador Tea, Cranberry and other plants of this association. For this reason it is difficult to reach the margin of the lake at any point and walking is hazardous along the shores. At one place a pole was driven into the bog for a depth of eight feet without striking bottom. A considerable area of rough woodland is adjacent to the lake and there is a scattered growth of conifers and deciduous trees along the shore at many places. Most of the arable land near the lake is under cultivation and it would seem unlikely that any scheme of adding to this area by drainage will be undertaken in the future owing to the excessive depth of the muskeg.

At the end of the lake is an extensive bed of rushes—good cover for nesting water-fowl. A small stream emptying into this end is frequented by a colony of beaver and in reaching the lake by this route one passes numerous feeding trails, a substantial dam and one fair-sized house. Muskrats are numerous and recently a number have been trapped by officers of the Game Conservation Board for liberation on Vancouver Island.

A small number of Mallard, Pintail and Green-winged Teal were observed on April 4th, 1924, along the edge of the tule bed referred to above, and several flocks passed overhead. It is reported that large flocks of duck frequent the lake during the winter months.

Wild-rice has been grown successfully at Burnaby Lake and no doubt could also be grown at Trout and Deer Lakes. Probably other species of plants such as wild celery and sago pondweed would also flourish if introduced.

LEECH RIVER DISTRICT, VANCOUVER ISLAND, BRITISH COLUMBIA

In June, 1925, the Leech River District was visited via Canadian National Railway from Victoria. Leaving the train at Leechtown the journey was continued on foot by way of a well worn trail along the north side of the Leech River for some six miles to the Forks where we left our packs. From this point we followed an old blazed trail leading north west and ascended approximately 1200 feet in a distance of four miles reaching the west fork of the Leech River a short distance above the falls. After noting the topography of this area we retraced our steps to the Forks and made camp. The following day the north and middle forks of the river were ascended a short distance, MacDonald's Lake, Martin's Gulch, Kennedy's Flat and other points of note were examined and I then returned to Victoria by train.

The country traversed is said to be typical of the area. Topographically it may be described as a series of low-timbered mountains, those lying south of the Leech River forming a definite and continuous ridge while those to the north are more or less isolated by steep valleys formed by the numerous confluents of the river. Zonally, the area is considered intermediate between the humid west-coast belt and the dryer south-coast association characterized by the Garry Oak and Madrona. The forest is virgin, semi-open, and practically continuous. Douglas fir is the chief conifer, but on the lower levels there is some Western White pine and Jack pine. Along the river are found Broad-leaf Maple and Sitka Alder. In the old burns there is good reproduction, chiefly Hemlock and White Pine. Apparently no timber has been cut and the stands are of considerable value.

From a stock-raising or agricultural point of view the district is thought to be valueless. A road of sorts extends from Shawnigan Lake to Sooke Lake. The various points visited are hereafter described in more detail.

LEECHTOWN

Nothing is left of Leechtown save a few hand-hewn timbers marking the site of the Government House built by Governor Douglas in the early 60's, after the Leech River placer camp assumed importance. This settlement, reported to have contained upward of five thousand men during the best days, was centered about Kennedy's Flat at the junction of the Sooke and Leech Rivers. Claims extended up the Leech River to the forks before referred to and the river between these points was flumed. This entire area has gone back to nature, Kennedy's Flat is grown up with forest and practically nothing remains to mark what at one time was the central point of interest on the Pacific Slope.

Legend relates that the usual appurtenances of a frontier mining camp were not lacking at Leechtown. One Black Jack McDonald conducted a combined dance hall, saloon and gambling place—the lake described later bears the name of this locally famous gentleman. There are extant hectic stories of manslaughter, of bullion looted from a stage coach and secretly buried, of the finding and subsequent loss of the mother-lode, in fact the Bret Harte tradition has been transplanted in its entirety and is preserved in such names as Bacon Bar, Martin's Gulch and The Devil's Grip. There still is gold in the Leech River and mining is carried on sporadically by a few old timers.

LEECH RIVER

This is a confluent of the Sooke River; the latter drains Sooke Lake and empties into Sooke Harbour. Low water prevailed at the time of my visit and the stream was crystal clear—a series of deep pools joined by narrow torrents, sometimes in miniature box canyons with walls of vertical slate, again cascading over polished rock, or slipping past stretches of slaty sand. The river bed is wide and piled with innumerable boulders of greyish rock, probably of volcanic origin, whose worn, striated condition indicates the force and volume of water during times of flood. There are no bridges and during such times the river would be impassable. The Leech River is a stream of remarkable beauty, notable even in a country famous for beautiful streams.

THE MEADOW TRAIL

This is a well marked trail from Leechtown along the north side of the Leech River to the Forks. It dates back to the days of the gold-rush. For the most part it is high above the river, through fir timber, across old burns grown up with bracken, salal and hemlock reproduction, over six or seven small icy streams, along sloping side hills and descending finally to the river bed near the Forks. From many points can be seen through intervening timber the foaming little river below. In the pools, the water is so still and clear that every pebble on the bottom can be seen.

There are other trails but none so well marked; probably that known as the Baker trail, from Sooke Lake to Jordan Meadows is the one best known of these others.

FALLS ON THE WEST FORK

To reach the falls we ascended a hill approximately 1200 feet high between the west and middle forks, travelling by an old trail marked by almost obliterated blazes. This hill is covered with a coniferous forest of Douglas fir, western White pine and Western hemlock. We came out on a rocky summit covered with lichens and crossing this descended into the canyon of the stream several hundred yards above the lip of the falls. Picking our way amongst the strewn boulders in the stream bed we soon reached the end of the canyon to look down on the main valley of the Leech. To the right of one facing thus is a perpendicular cliff of slate some 150 feet in height, marking the end of the canyon and the lip of the falls. From the base of this cliff the stream cascades down in a series of leaps to the valley below. The height of the falls is said to be 300 feet. At this season little water is passing over and from where we stood directly above the falls the view was disappointing. Later a descent was made over deeply scored rocks below the first small cascade but I was unable to obtain a good photograph. All evidence points to a great rush of water at flood time and then the sight must be truly imposing.

MACDONALD'S LAKE

The shores of this small lake, hidden away in the forest, are low and swampy and support various aquatic plants such as splatter dock, which provide food for the few ducks which frequent its waters. The lake was once stocked with trout but these apparently did not survive as there is said to be no fishing now. It is a mile or less distant from Leechtown and at an elevation of approximately 150 feet above the Leech River into which it drains. During the gold-rush the end of the lake was dammed and a ditch dug into Martin's Gulch to provide the miners with water. A portion of this dam and the ditch are still in a fair state of preservation.

WILD LIFE

As is usual in virgin forests of the West, bird life was found to be scarce in number of species and individuals. The following species were noted in small numbers: Red-shafted Flicker, Pileated Woodpecker, Russet-backed Thrush, Western Winter Wren, Oregon Junco, Steller's Jay, Hammond's Flycatcher, Olive-sided Flycatcher, Dipper, Western Robin, Western Red-tail and Sooty Grouse.

Bear and Cougar signs were noted and, judging by the number of tracks, Black-tail deer are abundant.

There is very little fishing to be had on any of the streams.

Practically the whole district is excellent deer and Blue-grouse country and is now over-hunted. It may be stated that during the summer the Coast Blue-grouse feeds largely on salal berries, salmon berries, huckleberries and other wild fruits which ripen early on the lower hillsides and valleys. Early in the autumn there is a migration to higher altitudes where the berry crops are later in maturing. When this food is exhausted fir-needles become the stable diet.

BENTINCK ISLAND

Bentinck Island, reserved as a leper colony, is situated off Rocky Point in the Strait of Juan de Fuca about twenty miles south west of Victoria and is separated from the mainland by a narrow channel through which the tides pass at considerable speed. The total area of the island,

which is of irregular shape, suggesting a shamrock in outline, approximates 60 acres. In the shores of grey rock the sea has cut deep clefts and coves; the beach, for the most part, is a jumbled mass of fallen rocks worn smooth by the pounding seas. The timber on the island consists principally of Douglas fir; jack pine and a few madronas. The conifers are of fair size except along the wind-swept shores where all the trees are decumbent and twisted into weird shapes and similar to those found above timber line on high mountains.

During an inspection made on July 2nd, 1924, it was discovered that no sea-birds nest on the island, perhaps because of its nearness to the mainland—such situations usually being avoided owing to the certitude of attack by predatory mammals. Pheasants and Blue grouse are said to be not uncommon but none were seen during my visit. Passerine birds were observed to be scarce; one Flicker, several Rufous-backed Chickadees, Oregon Juncos and Western Flycatchers being the only species encountered. In the channel referred to above, a few Glaucous-winged Gulls in the second or third year, and one Pelagic Cormorant were noted.

Bentinck Island is of great natural beauty and is interesting to a botanist or a marine biologist, but from the view point of an ornithologist it offers little attraction. The isolated Race Rocks, a mile or perhaps less, directly south of Bentinck Island are known to be a nesting ground for Glaucous-winged Gulls, Pigeon Guillemots and Black Oystercatchers. Probably these rocks provide adequate nesting space for the sea-birds which breed locally.

A LIST OF AQUATIC MOLLUSCS OF THE ABITIBI REGION

By J. L. HART

DURING the summer of 1925 the writer was a member of an Ontario Fisheries Research Laboratory field party on Lake Abitibi, where the author took advantage of the opportunity to collect the molluscs of the district. An annotated list of the land molluscs collected there appeared in the May number of *The Canadian Field-Naturalist* for 1929. The present paper includes a list of the aquatic molluscs taken by us in this region. The specimens have been identified by Dr. Bryant Walker, whose help I gratefully acknowledge.

Lymnæa stagnalis appressa Say.

Lymnæa ferruginea Haldeman ?—This species, according to Dr. Bryant Walker, has been previously recorded only from the west coast. The record of a western mollusc is of especial interest in this district when associated with the records of other western species such as the goldeye, *Amphiodon alosoides*, by Dymond and Hart, (1927), *Pellenes luggani* and *Cariarachne brunneipes*, two western spiders by Emerton (1928), *Aeshna interrupta lineata*, a western race of dragon fly by Walker (1928) and *Eutamias minimies borealis*, the western chipmunk recorded by Snyder along with other western forms (1928).

Lymnæa palustris Müller.—Common in shallow water and small pools.

Lymnæa catascopium Say.—Evidently not common.

Planorbis trivolvis Say.—A large form of common occurrence.

Planorbis exacuous Say.

Planorbis hirsutus Gould.—Apparently not plentiful.

Planorbis atronasus striatus Lea.

Physa gyrina Say.—Found in pools in woods and about marshy shores.

Physa ancillaria Say.

Physa sayii warreniana Lea.—Specimens from small pools and Circle river as well as from the main body of the lake.

Valvata tricarinata unicarinata DeKay.

Valvata tricarinata simplex Gould.

Valvata sincera Say.

Amnicola limosa Say.—Fairly common.

Anodonta marginata Say.—Specimens from small neighbouring lakes and Teddy Bear river.

Anodonta grandis footiana Lea.—Common in Lake Abitibi. Specimens from Trollope Lake.

Unio complanatus Solander.—Common in Lake Abitibi.

Lampsilis radiata Gmelin*.—A single damaged shell was found in a small pool at Lowbush.

Sphærium rhomboideum Say.—Common in a small boggy lake on Long Point, Lake Abitibi.

Sphærium sulcatum Lamarck.—Two specimens from the Circle river.

Pisidium neglectum Sterki.

Pisidium scutulatum Sterki.

Pisidium concumulum Sterki. A single specimen from the Lowbush river.

As the work on the Mollusca was secondary

to the study of the fish of the region, it is probable that further investigation will lead to the discovery of species not recorded here. This is especially true of the *Sphæriidæ*.

*(I doubt *L. radiata* to exist so far north. A similar, but distinct species, the *L. luteola* of the check lists, does. An imperfect valve of either is hard to identify; even perfect specimens cause trouble. A particulary fine *luteola* from the Rideau Canal remained for years labelled *radiata* in the U. S. National Museum at Washington until I convinced the late Dr. Dall that it was *L. luteola*, when the label was changed.—F. R. LATCHFORD)

FRESHWATER CLADOCERA FROM SOUTHERN CANADA, COLLECTED BY FRITS JOHANSEN IN 1925-26

By CHAUNCEY JUDAY

(See also *Canadian Field-Naturalist* Vol. 41: 130-131, 1927.)

Pools in fields outside Wrightville, (Hull) Quebec, May 17, 1925:

Daphnia pulex (de Geer)
Simocephalus exspinous (Koch)
Simocephalus serrulatus (Koch)
(also the Ostracod *Cypris pubera*).

Pools in fields at Billings Bridge, Ottawa, Ont., May 25, 1925:

Daphnia pulex (de Geer)
Scapholebris mucronata (O. F. Mueller)
Chydorus sphaericus (O. F. Mueller)

Pond in field at Tenaga, Gatineau River, Quebec, June 2, 1925:

Daphnia pulex (de Geer). Small ephippial forms and large parthenogenetic forms.

Pools in fields at Billings Bridge, Ottawa, Ont., May 15, 1926:

Daphnia pulex (de Geer)

Ponds in the fields at Tenaga, Gatineau River, Quebec, May 17, 1926:

Daphnia pulex (de Geer)

Pools in pasture between Fairy Lake and Kings Mountain, Quebec (near Ottawa), May 30, 1926:

Simocephalus exspinosus (Koch).

Pools in pasture at Billings Bridge, Ottawa, Ont., June 5, 1926:

Daphnia pulex (de Geer)
Simocephalus exspinosus (Koch).

Ponds in Porteus' Garden, St. Petronille, Orleans Island, Quebec, June 12, 1926:

Daphnia pulex (de Geer)
Simocephalus exspinosus (Koch).

Pond below water-reservoirs in Victoria Park, Truro, N.S., Sept. 23, 1926:

Daphnia pulex (de Geer).

(May 1929.)

NOTES AND OBSERVATIONS

NOTES ON SOME SMALL CANADIAN RODENTS.—The feelings of any restless mammalogist, gazing at Canada's "Outer Marches", can be well expressed by Kipling's fine lines—"We yearned beyond the sky line where the strange roads go down". So perhaps the following short notes on some retiring mammals will not be out of order.

UNGAVA VOLE. *Phenacomys ungava ungava* Merriam.—A collecting trip of mine to Franz, Ontario, in July, 1925, failed in its main objective—to find this animal. A second trip, in mid-April, 1929, succeeded. Franz might be likened to a grim gray citadel of pre-Cambrian rocks, camouflaged by scrubby black spruces, balsam firs, canoe birch, banksian pine, and quaking aspen. Due to glacial action there is little soil. The annual range of temperature is from 82° above to 58° below. The altitude is 1219 feet. My two specimens were trapped under two feet of snow in a swale, forested with balsams and birches. The only available food seemed to be balsam cones and leaves or Labrador tea. The two specimens are apparently in winter pelage and have no buffy tints on nose, said to mark this animal. Perhaps the taxonomy of the Canadian *Phenacomys* is still hazy.

COOPER LEMMING MOUSE. *Synaptomys cooperi cooperi* Baird.—Two taken April 23 and 26, in sphagnum, Labrador tea association under black spruces, at Pine Falls, on Winnipeg river, in S.E. Manitoba.

In July, 1925, four were taken further up the river at Minaki, in extreme western Ontario.

RICHARDSON LEMMING MOUSE. *Synaptomys borealis borealis* (Richardson).—It was a surprise to find this species, as well as *cooperi*, at Pine Falls, Manitoba, in April, 1929. Two taken in rather open tamarack bog, in association with saddle-backed and Hoy's shrews, whereas *cooperi* was found in shady forest swamp of black spruce. In May following, at Cranberry portage, Athapapuskow lake, 50 miles north of the Pas, Manitoba, a number were taken. A male taken May 5th had dorsal fur 15 mm. long. Side glands 11 mm. long by 7 mm. wide. Lakes were still frozen over. A female, taken May 8, contained three large embryos 30 mm. long. Cranberry portage, like Pine falls, lies on the edge of the pre-Cambrian formation in Manitoba.—MORRIS M. GREEN, Ardmore, Pennsylvania.

BOOK REVIEW

EXPERIMENTS IN BIRD MIGRATION. I. MANIPULATION OF THE REPRODUCTIVE CYCLE: SEASONAL HISTOLOGICAL CHANGES IN THE GONADS. (THESIS APPROVED FOR THE DEGREE OF DOCTOR OF SCIENCE IN THE UNIVERSITY OF LONDON.) BY WILLIAM ROWAN. *Proceedings of the Boston Society of Natural History. Vol. 39, No. 5, p. 151-208, pl. 22-32. Boston: Printed for the Society. From the William Brewster Fund. October, 1929.*

The subject of bird migration, which has long attracted the study and the thought of ornithologists and of other scientists, has been brought markedly nearer to satisfactory explanation by the careful experiments, ingeniously devised and arduously carried out, that are here described and discussed by their author, Dr. Rowan. Leaving aside, for the time, at least, the questions of the origin and the method of migration, Dr. Rowan has concentrated his researches on the question of its annual causation, and has succeeded in illuminating much that has hitherto been shrouded in darkness.

The "working hypothesis" and "logical starting point" that guided the author in the initiation of his investigations was "that migration might be attributed to a hormone produced by the gonads at certain seasons and that the condition of the gonads depended on the length of day at certain times of the year—not temperature", athough extraneous factors may also be involved, especially in producing inhibitions and in completing migration. The experiments that followed were all but one conducted in winter in unheated aviaries out-of-doors at Edmonton, Alberta, where the temperature was frequently below zero Fahrenheit for long periods. Large numbers of Juncos, with a few individuals of other species of native North American Sparrows, were trapped near Edmonton in autumn and placed in the aviaries. Some thirty Canaries were also used in the experiments. All the birds throve in spite of the cold.

In each case one group of birds in one aviary was maintained simply for comparative or "control" purposes, while the experimenting was done with another group of birds in another aviary. In several experiments, which varied chiefly in the strength of the artificial lighting used, one group of birds was permitted to experience the gradually shortening days of autumn and early winter, while at the same time the other group was subjected to artificial lighting in such a way as to have the effect of lengthening progressively the daily period of light (considering natural and artificial light together) by about five minutes a day. The lights used were incandescent electric bulbs. From time to time some birds were killed for examination of the gonads and others were released (generally with bands on), so that their behavior under such circumstances might be noted. It was found that, in general, such slight, regular increases in the daily period of bright light resulted, in spite of season and low temperature, in gradual enlargement of the gonads, especially of the testes of the male birds, until a condition approximating that at mating time was reached.

Then, during January and February, when the days at Edmonton were lengthening, birds whose gonads had been thus enlarged were subjected, by means of a wooden shutter properly applied to their aviary, to gradually decreasing daily periods of light, while others in similar condition were simply subjected to a sudden drop from a partly artificial daily period of light of fifteen hours to one of about nine. In both cases the gonads decreased in size until they became extremely small, though they did not reach the winter minimum. Some of these birds were subjected to lengthening periods of light once more in the spring months, with the result that their gonads again enlarged and approached breeding condition!

Another experiment, in which the daily increase in the lighted period was made fourteen minutes, was not followed by uniform recrudescence of the gonads of the birds used, seeming to indicate that the abnormally daily increase in light used was more than most individuals would respond to.

Finally, two small groups of birds were taken indoors and placed in small cages, where they were subjected to the same, unaltered period of light day after day. One group, however, was allowed to roost in peace when their cage became dark, while the other group was subjected to "compulsory exercise" in near-darkness, by means of a mechanically-operated moving bar in their cage, for a period immediately following the cessation of daylight and increasing daily by 7.5 minutes. This gradually and regularly lengthening period of exercise was found to result in increase in size of the gonads of the birds subjected to it, just as if it had been a similarly-lengthening period of light. From this it is deduced that what really brought about the increase in size of gonads of birds subjected to gradually-lengthening daily periods of light was not the direct action of the light itself, but was the activity in which the light induced the birds to engage!

Birds released at various stages during these experiments tended strongly to stay about the aviaries, in spite of wintry conditions, if their gonads were at their minimum or their maximum.

When their gonads at time of release were increasing or decreasing, many of the birds released departed and were not seen again. That all birds in such condition did not depart in this way may be attributed, in part, at least, to the inhibiting effects of severe wintry weather and recent captivity.

Careful histological examination of the testes, ovaries, thyroids, parathyroids, and suprarenals of birds killed at various stages during the experiments were made by Dr. Rowan and are described in detail. Comparatively slight changes were observed in the thyroids, parathyroids, and suprarenals, but marked changes were found in testes and ovaries, and many of these are illustrated as well as described. The recrudescence artificially induced in autumn was found to involve, in the testis, not only enlargement of the entire structure, but also development within it, proceeding as far as sperm formation. Liberation of sperms was not observed at any stage, not even in the testes of a wild male collected when paired and engaged in nest construction, and it is suggested that, in this species, such liberation may not occur until immediately prior to the time of fertilization. Decrease in size of the testes was found to be accompanied by degeneration of the intratubular material within them.

Interstitial tissue that is apparently endocrine in function occurs most conspicuously in both testes and ovaries when these are waxing or waning, that is, normally at migration-time. It is suggested that this is more than a coincidence and that this tissue is responsible for arousing the migratory impulse. This view is strengthened by the fact that, in spring, this tissue appears about two weeks earlier in the gonads of the male than in those of the female, and that, in spring migration in this species, the male goes north in advance of the female, while the reverse holds in both relations in the fall.

Thus the general conclusion reached from these experiments is that, in the case of the Junco (and perhaps of some other species of its group), the gradually increasing length of day in spring permits a lengthened period of activity that brings about an increase in size and an internal development in the gonads, while the gradually decreasing length of day after the summer solstice causes a shortened period of activity that results in decrease in size of the gonads and disintegration of their developed sex cells. Both recrudescence and retrogression are accompanied by a marked increase in interstitial tissue within the gonads, and this tissue, through production of appropriate hormones, arouses the impulse to migrate.

This is a most striking conclusion, reached as a result of very interesting work. It is an important milestone, in new territory, on the way toward full understanding of the intriguing subject of bird migration. Even after it has been checked by other workers, however, caution will still be necessary in applying it to other species and other conditions.

A delightful pencil drawing of a pair of Shufeldt's Juncos, from the gifted hand of the author, accompanies the paper.

It is of interest to note that while Dr. Rowan finds himself obliged to state, in a foot-note on page 175, "Apparently none of the books commit themselves on the subject of double broodedness in the Junco", this point has recently been illumined by the studies of Wendell P. Smith, made with banded Juncos in northern Vermont (Bull. N.E. Bird Banding Assn., vol. IV, no. 4, pp. 137-141 and Bird-Banding, vol. I, no. 1, pp. 36-40.). Mr. Smith records the actions of a pair of Juncos that, in 1929, hatched three broods, of which the first and third left the nest safely, while the second, when about four days old, was destroyed in the nest by some marauder. Under these circumstances the female of this pair laid her last egg for the season on July 27, more than a month after the summer solstice.

In the course of his introduction, Dr. Rowan makes a curious reference to "ornithologists in the strictest sense of the term, i.e., people mostly without scientific training." Such aspersions as this help no one, least of all their author. According to Sir James Murray's "New English Dictionary", zoology is "the science which treats of animals, constituting one of the two branches (zoology and botany) of Natural History or Biology, and comprising many subordinate branches, as ornithology, ichthyology, entomology, etc." Ornithology is conversely defined by the same authority as "the branch of zoology which deals with birds, their nature and habits." The Encyclopædia Britannica (14th edition, 1929) says, "Ornithology is the science of birds". A zoologist, according to the "New English Dictionary", is "one versed in zoology; a scientist who studies or treats of animals", while in the same work we read that an ornithologist is "one who studies or is versed in ornithology; a student of birds".

To put the matter in fewest words, an ornithologist, "in the strictest sense of the term", is one versed in the science of birds, precisely as a zoologist is one versed in the science of animals. While it is probably true that, as Ludlow Griscom has recently said, "the term 'ornithologist' has been frequently abused" (Bull. N.E. Bird Banding Assn., vol. V, no. 1, p. 17) yet the true ornithologist, to whom the term is correctly applied, is a

scientist and has scientific training, obtained in some cases in a university, in some cases elsewhere. Moreover, since the ornithologist's field is more restricted than is that of the general zoologist, it affords opportunity for greater scientific specialization.

But this is a very minor point in an otherwise excellent work. Congratulations are due to Dr. Rowan from all interested, from any angle, in birds and their activities, for the production of a most useful, stimulating, and outstanding paper. —H.F.L.

OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

Published by Authority of the National Parks of Canada Branch, Department of the Interior, Canada

In the following returns upon banded birds it will be noted that some returns may be thought to indicate, from the date of capture, violations of the Migratory Bird Act of Canada or the United States. The great majority of returns, which seem to indicate violations, are from birds accidentally caught in traps set for fur-bearing mammals, from birds caught in fish nets, killed by oil, or from birds found dead from unknown causes. Appropriate action has been taken in connection with the few returns which indicate illegal shooting.

RETURNS UPON BIRDS BANDED IN 1921

HERRING GULL, No. 100,612, yg., banded by Ernest Joy, at Little Wood Island, Grand Manan, New Brunswick, on August 18, 1921, was "picked up" on Moose River, near Lubec, Maine, during the month of October, 1928.

RETURNS UPON BIRDS BANDED IN 1922

MALLARD, No. 230,317, banded by F. C. Lincoln, at the Sanganois Club, Browning, Illinois, on November 20, 1922, was shot at Dun, durn, Saskatchewan, on October 12, 1928.

BLACK DUCK, No. 207,787, banded by H. S. Osler, at Lake Scugog, Ontario, on September 23, 1922, was killed at Barnegat Bay, New Jersey, on November 20, 1928.

RETURNS UPON BIRDS BANDED IN 1923

BLACK DUCK, No. 296,157, banded by H. S. Osler, at Lake Scugog, Ontario, on September 17, 1923, was killed on the Delaware River, just above Fort Mott, New Jersey, on November 20, 1928.

RETURNS UPON BIRDS BANDED IN 1924

MALLARD, No. 305,030, banded by John Broeker, at Portage des Sioux, Missouri, on March 16, 1924, was "brought down at a place nine miles north of Biggar, Saskatchewan, during the week of October 29, 1928.

BLACK DUCK, No. 297,869, banded by H. S. Osler, at Lake Scugog, Ontario, on September 16, 1924, was shot at Cedar Island Beach, Virginia, on December 27, 1928.

BLACK DUCK, No. 323,283, banded by H. S. Osler, at Lake Scugog, Ontario, on October 3, 1924, was shot at Bluff Point, four miles from Kilmarnock, Virginia, on November 23, 1928.

RETURNS UPON BIRDS BANDED IN 1925

MALLARD, m., banded by Jack Miner, at Kingsville, Ontario, during the fall of 1925, with one of Mr. Miner's bands bearing a verse of Scripture, was caught, had its picture taken, and was banded with Biological Survey band No. 405,466, by T. E. Musselman, at Lima Lake, Illinois, on March 24, 1927, and was shot on the Ninnescah River, Castleton, Reno County, Kansas, on November 21, 1928.*

MALLARD X ENGLISH CALL DUCK, No. 309,779, yg., dark, banded by R. Lloyd, at Davidson, Saskatchewan, on August 9, 1925, did not migrate in the fall on account of mild weather, was wintered and released in the spring of 1926, and was shot at Swift Current, Saskatchewan, on November 22, 1928.

BLACK DUCK, No. 389,397, banded by H. S. Osler, at Lake Scugog, Ontario, on October 8, 1925, was killed at Whiteville, North Carolina, on December 10, 1928.

RETURNS UPON BIRDS BANDED IN 1926

MALLARD, No. 388,550, f., banded dy Paul E. Page, at Lac Ste. Anne, Alberta, on August 22, 1926, was recovered at Gannett, Idaho, on November 4, 1928.

MALLARD, No. 388,555, f., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 24, 1926, was killed at Boyd Lake, Loveland, Colorado, on November 12, 1928.

BLACK DUCK, No. 389,183, banded by H. S. Osler, at Lake Scugog, Ontario, on September 28, 1926, was killed at English Lookout, Louisiana, on November 24, 1928.

BLACK DUCK, No. 457,607, banded by H. S. Osler, at Lake Scugog, Ontario, on October 7, 1926, was shot at St. Francois du Lac, Yamaska County, Quebec, on September 12, 1928.

BLACK DUCK, No. 457,733, banded by H. S. Osler, at Lake Scugog, Ontario, on October 10, 1926, was killed at Inglis, Florida, on November 23, 1928.

BLACK DUCK, No. 464,214, banded by H. S. Osler, at Lake Scugog, Ontario, on October 16, 1926, was shot at Port Clinton, Ohio, on November, 15, 1928.

RING-NECKED DUCK, No. 457,979, banded by H. S. Osler, at Lake Scugog, Ontario, on October 20, 1926, was shot at Georgian Bay, Midland, Ontario, on October 5, 1928.

RETURNS UPON BIRDS BANDED IN 1927

COUES'S CASPIAN TERN, No. 497,548, juv., banded by Harrison F. Lewis, on Fog Island, Fog Island Sanctuary, Saguenay County, Quebec, on August 2, 1927, was shot for scientific purposes, at Currituck Light Beach, North Carolina, on July 31, 1928.

CALIFORNIA GULL, No. 544,309, yg., banded by F. L. Farley, at Gull Island in Bittern

*C.F.-N., XLI. 1927, p. 204.

Lake, 12 miles west of Camrose, Alberta, on June 22, 1927, was found dead at Lake Helena, Lewis and Clark County, Montana, on November 19, 1928.

CALIFORNIA GULL, No. 544, 402, yg., banded by Frank L. Farley, at Gull Island, in Bittern Lake, 12 miles west of Camrose, Alberta, on June 22, 1927, was shot at Czar, Alberta, on December 3, 1928.

MALLARD, No. 602,050, banded by F. H. Rose, at Moiese, Montana, on September 21, 1927, was shot at Bowden, Alberta, on November 8, 1928.

MALLARD, No. 324,927, m., banded by Miss Jessie Innes, at Headingly, Manitoba, on October 15, 1927, was shot at Carlos, Minnesota, on November 21, 1928.

MALLARD, No. 555,973, banded by F. H. Rose, at Moiese, Montana, on October 30, 1927, was shot at Barnwell, Alberta, on November 30, 1928.

MALLARD, No. 595,137, banded by F. H. Rose, at Moiese, Montana, on November 8, 1927, was shot at Goodwater, Saskatchewan, on November 17, 1928.

MALLARD, No. 595,574, banded by F. H. Rose, at Moiese, Montana, on November 12, 1927, was shot at a place near Nanton, Alberta, during the month of November, 1928.

MALLARD, No. 597,130, banded by F. H. Rose, at Moiese, Montana, on November 23, 1927, was shot at Gadsby, Alberta, on October 31, 1928.

MALLARD, No. 465,921, f., banded by R. H. Bruce, at Rockwood Park Sanctuary, Saint John, New Brunswick, on November 26, 1927, was shot in the same locality, on October 15, 1928.

BLACK DUCK, No. 496,133, banded by A. G. Allen, at Oakdale, New York, on March 5, 1927, was shot at East Publico, Nova Scotia, on November 13, 1928.

RED-TAILED HAWK, No. 200,643, yg., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on July 10, 1927, was shot at Tulsa, Oklahoma, on November 8, 1928.

RETURNS UPON BIRDS BANDED IN 1928

BLACK GUILLEMOT, No. 560,261, banded by Oliver L. Austin, at a place 15 miles southeast of Ford Harbour, Newfoundland Labrador, on August 9, 1928, was shot at Godbout, Quebec, on November 15, 1928.

HERRING GULL, No. 554,374, banded by A. D. Trempe, at Tahquamenon Island, Michigan, on July 10, 1928, was captured at St. Philippe, Quebec, during the month of July, 1928.

CALIFORNIA GULL, No. 699,091, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 23, 1928, was recovered on the North Platte River, about ten miles east of Ogallala, Nebraska, on October 17, 1928.

COMMON CORMORANT, No. 302,394, juv., banded by Harrison F. Lewis, at Lake Island, near Cape Whittle, Saguenay County, Quebec, on August 2, 1928, was caught in a herring net on Ramea Island, Newfoundland, on November 23, 1928.

MALLARD, No. 557,028, part Albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was shot at Granite Falls, Minnesota, on November 20, 1928.

MALLARD, No. 557,034, part Albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was shot at a place 25 miles southwest of Watrous, Saskatchewan, on November 6, 1928.

MALLARD, No. 557,077, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was shot at a place six miles west of Fargo, North Dakota, on November 28, 1928.

MALLARD, No. 557,079, part Albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was shot at York, Alabama, on November 16, 1928.

MALLARD, No. 208,422, banded by Fred Bradshaw, at Lucky Lake, Saskatchewan, on July 28, 1928, was shot at a place four miles south of Regina, Saskatchewan, on October 17, 1928. Before being banded this bird was picked up at Lucky Lake, afflicted by "duck disease", and absolutely helpless. It was taken a distance of one hundred and twenty-five miles to Regina, where it was given fresh water for a few days, and then liberated in Wascana Lake, Regina.

MALLARD, No. 388,622, m., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 23, 1928, was shot at a place two and one-half miles southeast of Wentworth, South Dakota, on November 14, 1928.

MALLARD, No. 388,628, juv., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 25, 1928, was shot in Jackson County, Kansas, on November 4, 1928.

MALLARD, No. 557,104, part Albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 5, 1928, was shot at Bladworth, Saskatchewan, on November 20, 1928.

MALLARD, No. 557,106, part Albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 5, 1928, was shot at Holdfast, Saskatchewan, on November 10, 1928.

MALLARD, No. 466,054, f., banded by R. H. Bruce, at the Guy H. Humphrey Sanctuary, Hampton Station Marsh, Kings County, New Brunswick, on October 7, 1928, was shot at a place near Fall River, Massachusetts, on December 12, 1928.

MALLARD, No. 466,082, m., banded by R. H. Bruce, at the Guy H. Humphrey Sanctuary, Hampton Station Marsh, Kings County, New Brunswick, on October 7, 1928, was shot at Westport Point, Massachusetts, on November 28, 1928.

MALLARD, No. 557, 118, m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 15, 1928, was shot at Rush Springs, Grady County, Oklahoma, on December 4, 1928.

MALLARD, No. 557,134, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 16, 1928, was killed at a place eight miles south of Olney, Illinois, on November 15, 1928.

MALLARD, No. 557,145, m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 17, 1928, was shot at Otwell, Arkansas, on November 30, 1928.

MALLARD, No. 557,149, f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 17, 1928, was shot at Hereford, Texas, on December 2, 1928.

MALLARD, No. 557,158, m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 17, 1928, was shot at a place eleven miles south of Peoria, Illinois, on November 14, 1928.

MALLARD, No. 557,160, m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 18, 1928, was killed at McFaddin's Beach, twenty-five miles west of Port Arthur, Texas, on November 11, 1928.

MALLARD, No. 557,169, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 20, 1928, was shot at a place four and one-half miles east and one-half mile south of Coyle, Oklahoma, on December 3, 1928.

MALLARD, No. 557,172, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 20, 1928, was killed at a place eight miles west of Chandlerville, Illinois, on November 25, 1928.

MALLARD, No. 557,174, banded by Bert Lloyd, at Davidson, Saskatchewan, on October 20, 1928, was killed at a place near Brunswick, Missouri, on November 11, 1928.

MALLARD, No. 557,178, ad., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 21, 1928, was killed at Sampsel, Missouri, on November 7, 1928.

MALLARD, No. 557,180, ad., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 22, 1928, was shot at Mallard, Iowa, on November 11, 1928.

MALLARD, No. 557,192, juv., f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 23, 1928, was shot at Beaver Creek, Rock County, Minnesota, on November 19, 1928.

MALLARD, No. A-602,509, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 23, 1928, was shot at Harrison Mills, British Columbia, on November 19, 1928.

MALLARD, No. A-602,510, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 24, 1928, was re-captured at the same station, on October 25, 1928, and was shot at Nicomen Island, sixty-eight miles east of Vancouver, British Columbia, on November 28, 1928.

MALLARD, No. 557,205, ad., f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 26, 1928, was killed at Hog Lake, Sumner, Missouri, on November 4, 1928.

MALLARD, No. A-602,514, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 27, 1928, was shot at Upper Sumas, British Columbia, on November 8, 1928.

MALLARD, No. 557,214, ad., f., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 28, 1928, was shot at Aline, Ohio, on December 4, 1928.

MALLARD, No. A-602,515, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 28, 1928, was re-captured at the same station, on October 29, November 1, and November 5, 1928, and was shot at Dewdney, British Columbia, on December 2, 1928.

MALLARD, No. A-602,522, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 29, 1928, was re-captured at the same station on November 21, 1928, and was shot at Sumas Lake, Abbotsford, British Columbia, on November 28, 1928.

MALLARD, No. A-602,523, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 29, 1928, was shot at Goose Lake, British Columbia, on November 12, 1928.

MALLARD, No. 557,215, ad., m., banded by Bert Lloyd, at Davidson, Saskatchewan, on October 30, 1928, was shot at Stalwart, Saskatchewan, on November 3, 1928.

MALLARD, No. A-602,533, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on October 30, 1928, was shot at a place ten miles from where it was banded, on November 1, 1928.

MALLARD, No. A-602,536, banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 1, 1928, was shot at Pitt Lake, ten miles northeast of Vancouver, British Columbia, on November 3, 1928.

MALLARD, No. A-602,538, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 4, 1928, was killed at a place eight miles from where it was banded, on November 5, 1928.

MALLARD, No. A-602,552, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 6, 1928, was killed at a place fifteen miles northwest of Bellingham, Washington, on November 11, 1928.

MALLARD, No. A-602,556, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 6, 1928, was killed at a place twelve miles from where it was banded, on November 9, 1928.

MALLARD, No. A-602,560, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, eight miles west of Chilliwack, British Columbia, on November 20, 1928.

MALLARD, No. A-602,565, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed at Maple Falls, Washington, on November 19, 1928.

MALLARD, No. A-602,566, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at a place sixty miles east of Vancouver, Hatzic Prairie, British Columbia, on November 12, 1928.

MALLARD, No. A-602,570, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at a place twelve miles north of Bellingham, Washington, on November 15, 1928.

MALLARD, No. A-602,573, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver, British Columbia, on November 10, 1928.

MALLARD, No. A-602,574, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver British Columbia, on November 10, 1928.

MALLARD, No. A-602,576, m., banded by R. M. Stewart, at McGillivray Creek Game

Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Silver Valley, Pitt Lake, British Columbia, on November 25, 1928.

MALLARD, No. A-602,585, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver, British Columbia, on November 10, 1928.

MALLARD, No. A-602, 586, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Hatzic, British Columbia on November 12, 1928.

MALLARD, No. A-602,601, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Yarrow, British Columbia, on November 11, 1928.

MALLARD, No. A-602,602, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Goose Lake, British Columbia, on November 12, 1928.

MALLARD, No. A-602,612, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Abbotsford, British Columbia, on November 18, 1928.

MALLARD, No. A-602,614, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed at Ferndale, Washington, on November 30, 1928.

MALLARD, No. A-602,626, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed at Ridgefield, eighteen miles north of Vancouver, British Columbia, on November 18, 1928.

MALLARD, No. A-602,630, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, Vancouver, British Columbia, on November 19, 1928.

MALLARD, No. A-602,632, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver, British Columbia, on November 10, 1928.

MALLARD, No. A-602,638, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at a place three miles west of Lynden, Washington, on November 16, 1928.

MALLARD, No. A-602,646, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver, British Columbia, on November 10, 1928.

MALLARD, No. A-602,659, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Hatzic Prairie, sixty miles east of Vancouver, British Columbia, on December 9, 1928.

MALLARD, No. A-602,660, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Dewdney, British Columbia, on December 8, 1928.

MALLARD, No. A-602,667, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, near Chilliwack, British Columbia, on November 14, 1928.

MALLARD, No. A-602,668, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver, British Columbia, on November 10, 1928.

MALLARD, No. A-602,672, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver, British Columbia, on November 10, 1928.

MALLARD, No. A-602,675, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Hatzic, British Columbia, on November 11, 1928.

MALLARD, No. A-602,677, f., banded by R. M. Stewart, at McGillivray Creek Game Reseve, Chilliwack, British Columbia, on November 9, 1928, was shot at Huntingdon, British Columbia, on November 10, 1928.

MALLARD, No. A-602,685, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Pitt Lake, twenty miles from New Westminster, British Columbia, on November 10, 1928.

MALLARD, No. A-602,686, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sardis, British Columbia, on November 15, 1928.

MALLARD, No. A-602,692, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed at Fairfield Island, Chilliwack, British Columbia, on November 19, 1928.

MALLARD, No. A-602,694, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Huntington, British Columbia, on November 10, 1928.

MALLARD, No. A-602,700, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Harrison River, sixty-five miles east of Vancouver, British Columbia, on November 23, 1928.

MALLARD, No. A-602,701, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on December 1, 1928.

MALLARD, No. A-602,707, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 15, 1928.

MALLARD, No. A-602,712, m., banded by R. M. Stewart, at McGillivray Creek Game

Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Clatskanie, Oregon, on November 18, 1928.

MALLARD, No. A-602,713, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed at a place twenty-five miles from where it was banded, on November 11, 1928.

MALLARD, No. A-602,715, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Huntingdon, British Columbia, on November 10, 1928.

MALLARD, No. A-602,717, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was killed on Sumas Prairie, about seventy miles south and east of Vancouver, British Columbia, on November 10, 1928.

MALLARD, No. A-602,723, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Goose Lake, British Columbia, on November 12, 1928.

MALLARD, No. A-602,727, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 20, 1928.

MALLARD, No. A-602-729, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Chehalis, via Harrison Mills, British Columbia, on December 9, 1928.

MALLARD, No. A-602,731, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Hatzic, British Columbia, on November 18, 1928.

MALLARD, No. A-602,742, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Sumas Prairie, British Columbia, on November 10, 1928.

MALLARD, No. A-602,744, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Nicoman Island, ten miles above Mission, British Columbia, on November 12, 1928.

MALLARD, No. A-602,747, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Dewdney, British Columbia, on December 2, 1928.

MALLARD, No. A-602,748, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was shot at Chilliwack, British Columbia, on November 15, 1928.

MALLARD, No. A-602,758, f., banded by R M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 15, 1928, was shot at Harrison Hot Springs, British Columbia, on December 5, 1928.

SHOVELLER, No. 656,100, banded by Alex. Glennie, at Walsh, Alberta, on June 30, 1928, was killed at San Joaquin Valley, near Santa Cruz, California, on November 4, 1928.

PINTAIL, No. 379,773, banded by F. W. Robl, at Ellinwood, Kansas, on February 9, 1928, was shot at a place nine miles north of Estevan, Saskatchewan, on November 1, 1928.

PINTAIL, No. 600,631, banded by F. W. Robl, at Ellinwood, Kansas, on March 2, 1928, was shot at Conquest, Saskatchewan, on October 31, 1928.

PINTAIL, No. 600,795, banded by F. W. Robl, at Ellinwood, Kansas, on March 8, 1928, was shot at Yellow Grass, Saskatchewan, on October 8, 1928.

PINTAIL, No. 208,412, banded by Fred Bradshaw, at Lucky Lake, Saskatchewan, on July 28, 1928, was shot at a place eighteen miles northwest of Dodge City, Kansas, on November 1, 1928. Before being banded this bird was picked up at Lucky Lake, afflicted by "duck disease", and absolutely helpless. It was taken a distance of one hundred and twenty-five miles to Regina, where it was given fresh water for a few days, and then liberated in Wascana Lake, Regina.

PINTAIL, No. 208,417, banded by Fred Bradshaw, at Lucky Lake, Saskatchewan, on July 28, 1928, was killed at Midlothian, Texas, on November 6, 1928. Before being banded this bird was picked up at Lucky Lake, afflicted by "duck disease", and absolutely helpless. It was taken a distance of one hundred and twenty-five miles to Regina, where it was given fresh water for a few days, and then liberated in Wascana Lake, Regina.

PINTAIL, No. 656,009, juv., f., banded by Thomas N. Jones, at Jones Sanctuary, Elgin County, Ontario, on August 7, 1928, was found dead at the same station, on October 17, 1928.

PINTAIL, No. A-602,705, m., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on November 9, 1928, was recovered at Sumas Prairie, near Abbotsford, British Columbia, on November 26, 1928.

CANVAS-BACK, No. 455,323, yg., banded by T. E. Randall, at Forestburg, Alberta, on July 25, 1928, was shot at Redwood Creek, California, on December 1, 1928.

BLACK-CROWNED NIGHT HERON, No. 406,205, imm., banded by George Lang, at Indian Head, Saskatchewan, on June 24, 1928, was shot at a place near Valley City, Illinois, on October 15, 1928.

FLICKER, No. 650, 254, imm., banded by Philip Siemens, at Hepburn, Saskatchewan, on June 13, 1928, was recovered at Metz, Missouri, on November 24, 1928.

LEAST FLYCATCHER, No. A-99,824, imm., banded by George Lang, at Indian Head, Saskatchewan, on July 19, 1928, was found dead at the same station, on August 25, 1928.

BRONZED GRACKLE, No. 213,748, fledgeling, banded by Howard F. Cant, at 35 Lansdowne Road North, Galt, Ontario, on June 1, 1928, was found dead at the same station, on June 7, 1928.

ROBIN, No. 547,410, imm., banded by George Lang, at Indian Head, Saskatchewan, on June 8, 1928, was killed by a cat, at the same station, on June 14, 1928.

ROBIN, No. 547,450, imm., banded by George Lang, at Indian Head, Saskatchewan, on June 11, 1928, was found dead at the same station, on June 14, 1928.

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1929-30

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The official publications of THE OTTAWA FIELD-NATURALISTS' CLUB have been issued since 1879. The first were *The Transactions of the Ottawa Field-Naturalists' Club*, 1879-1886, two volumes; the next, *The Ottawa Naturalist*, 1886-1919, thirty-two volumes; and these have been continued by *The Canadian Field-Naturalist* to date. *The Canadian Field-Naturalist* is issued monthly, except for the months of June, July, and August. Its scope is the publication of the results of original research in all departments of Natural History.

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SOME NATURAL FACTORS GOVERNING THE FLUCTUATIONS OF GROUSE IN MANITOBA

By NORMAN CRIDDLE

THAT there are marked fluctuations, from time to time, in nearly every form of wild life is now recognized by all competent observers. We know that this is the case in many well known insect pests, it has been recognized among certain mammals, such as snow-shoe rabbits, beavers, skunks, badgers and weasels—to mention but a few outstanding examples. The same pendulum-like swing occurs in birds and since most people are more interested in the larger forms of life, grouse have become well known examples of this.

Now the question which we are all asking, and over which there is a good deal of controversy, is: what brings about this fluctuation? Is it due to predatory mammals or birds, to parasites, diseases or weather, or are the sportsmen and trappers responsible? It is perhaps natural that the average person should point to the destruction of eggs or nestlings by crows, hawks and predatory mammals as important factors in this fluctuation; but is not this, with the possibe exception of the Goshawk, a yearly toll rather than an intermittent one? Does it fluctuate from year to year to any marked extent? Personally, I think not. Moreover, we cannot blame predators for the almost periodic reduction in snow-shoe rabbits. Is there, therefore, any great justification for crediting them with the fluctuation in the number of grouse? After reviewing the evidence I am convinced that predators, at most, are only of secondary importance.

The influences of excessive rainfall and cold have been long recognized as important factors in reducing the number of young birds which would otherwise attain maturity, although it has not always been understood how this is brought about. Judging from my own observations I suspect that the mortality among young birds is not directly due either to rainfall or cold but that the real cause is starvation brought about by the inactivity of the insect population upon which the young birds are fed. If insects are excessively abundant, such as is the case, for instance, when there is a grasshopper outbreak, then the birds will have no difficulty in finding them even under adverse conditions, and the young, despite the rain and cold, will survive, but if insects are not in abnormal numbers then there will be a very high death rate due to starvation.

The above conclusions were brought rather forcibly to my attention through a study of Mountain Bluebirds and Tree Swallows. Both these species nest in hollow trees or in boxes erected for their accommodation and the young are, therefore, absolutely protected from rain and to a marked degree from cold; yet it is by no means an uncommon event for some of them to perish during prolonged cold or wet spells. On watching and timing the parent birds as they brought food to the young I discovered that the amount of food collected and taken to the nestlings, was only a third as great under conditions of cold and rain as it was when the weather was bright and warm. It will be seen, therefore, that while rain and cold are important in restricting the number of young birds reared, their influences are largely indirect and that the same results might be brought about without them, providing there was a scarcity of the insects upon which the young birds were normally reared.

The influence of parasites, both external and internal, upon wild life has been shown to be of importance. Moose and deer are at times killed by ticks, snow-shoe rabbits and jack rabbits suffer severely from tape-worn cysts, and of late there have been rather important discoveries made relating to the internal parasites of grouse some of which, it is believed, were introduced with the importation of foreign birds. We have still much to learn regarding the parasites of wild life and the study is so intricate that it can only be successfully carried out by fully equipped specialists.

Finally there is the question of diseases to be considered and it seems highly probable that in

these will utlimately be found the greatest of all causes for the fluctuation in wild life. Their influences to-day are best recognized in the case of the snow-shoe rabbit but as I have pointed out above, the baleful effect of disease is manifested in many other animals, including grouse. The recent widespread rarity of Ruffed Grouse can, I think, be explained in no other way; certainly it cannot be accounted for through the influence of predators nor by wide-spread adverse meteorological conditions.

A few years ago I commenced to make observations with a view to checking over some of the prevailing ideas concerning the fluctuation in wild life. One of the methods employed was to make a bird breeding census of one, or more, definite areas, the undertaking being a cooperative one with the United States Bureau of Biological Survey. In this work two areas were chosen which it was expected would remain unaltered for a number of years, the idea being to get uniformity of conditions for a long period of time. One of these census areas was planned to include a wood-lot, the other a farmyard with surrounding gardens, trees and fields. The census, unfortunately, has only been carried on for 16 years; a period far too short from which to draw accurate conclusions. The evidence, however, is suggestive and it seems, on that account, worth recording. The census, it will be noted, deals with upland birds and of these the only ones of special interest to sportsmen are the Ruffed Grouse and Crow. Both census areas are included in the following table though the grouse and crows were only present in the wood-lot. A number of the rarer birds have been purposely omitted. No hunting has been permitted in these areas at any time, the only predators excluded during the nesting season being Cooper and Sharp-shinned Hawks.

BIRD NESTING CENSUS AT AWEME, MANITOBA, SHOWING THE NUMBER OF BREEDING PAIRS

Year	Ruffed Grouse	Black-billed Cuckoo	Least Fly-catcher	Horned Lark	Crow	Baltimore Oriole	Vesper Sparrow	Chipping Sparrow	Clay-colored Sparrow	Catbird	House Wren
1914.....	2	4	5	10	1	1	11	2	9	6	14
1915.....	13	6	10	11	0	4	14	6	14	6	15
1916.....	7	3	14	12	2	3	10	5	11	6	17
1917.....	3	4	14	11	2	3	11	5	11	7	17
1918.....	1	4	12	11	2	2	8	5	8	5	20
1919.....	2	4	7	7	0	2	9	4	9	5	16
1920.....	2	5	12	9	1	2	15	3	9	7	16
1921.....	9	5	11	8	3	2	14	5	13	7	20
1922.....	7	2	13	7	2	2	11	5	9	8	16
1923.....	12	4	14	5	1	1	9	6	12	7	19
1924.....	12	5	9	9	2	2	17	4	12	9	11
1925.....	10	6	7	7	1	2	10	3	8	5	14
1926.....	3	5	8	9	1	1	12	6	12	6	12
1927.....	2	2	6	6	0	2	10	7	18	5	15
1928.....	1	4	4	7	0	2	14	6	12	6	13
1929.....	1	1	4	7	0	1	15	5	9	5	11

Perhaps one of the most significant suggestions from this study is that which indicates an almost periodic fluctuation in Ruffed Grouse. The area from which this evidence is drawn consists of a wood-lot comprising about 26 acres to which as I have pointed out Crows at all times have free access, while the Western-horned Owl and Goshawk are not infrequent visitors there. It seems evident, therefore, that the fluctuations in grouse which have taken place are not brought about by predators either feathered or furred, nor can the sportsman be blamed for them.

There may be a little disappointment on noting that the total number of migratory birds nesting within the areas in 1929 was so nearly the same as in 1914 but on consideration it will be seen that the list is made up almost entirely of small birds a majority of which have long enjoyed protection; the table, therefore, shows a normal fluctuation.

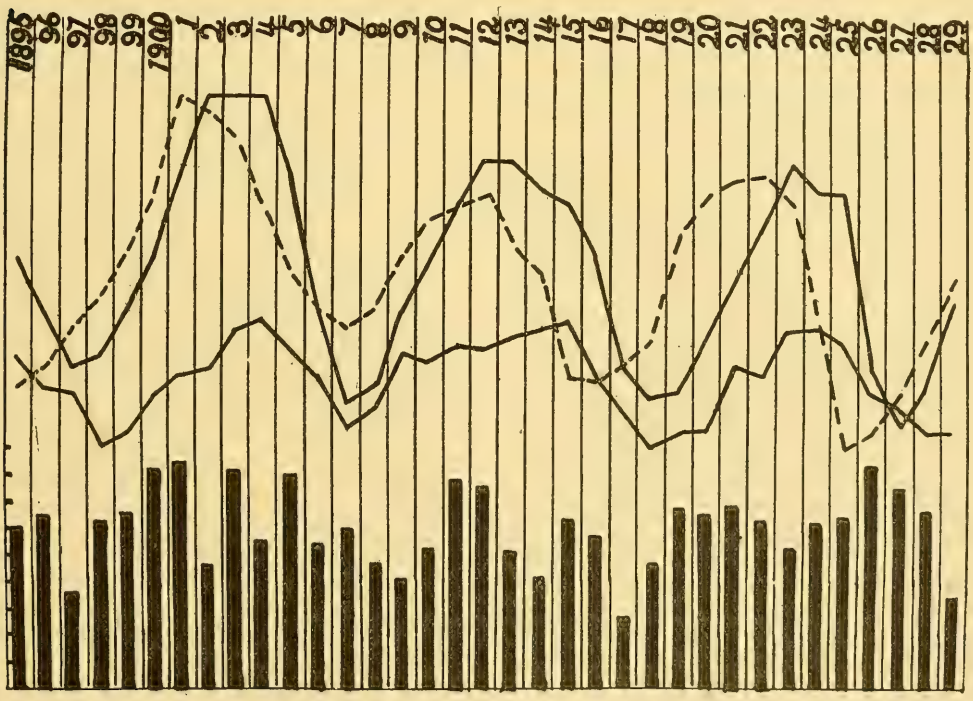
Perhaps one of the most interesting points brought out in another local study of wild life fluctuation has been one showing the remarkable regularity with which Sharp-tailed Grouse fluctuate in company with grasshoppers; that the young grouse were reared to a large extent upon grasshoppers has been recognized by my brothers

and me for some years but that the birds are apparently dependent to such a marked degree upon these insects will come to most people as a revelation. Indeed it seems wise to accept the apparent fact with reservation until it can be verified or disproved by further studies. The study, indeed might be enlarged to include other forms, and we suspect that, when it is completed, more will be thought of the value of insects in preserving birds and less of birds as destroyers of insects.

The following graph speaks for itself; the information upon which it is based has been taken from the journals of my father, Percy Criddle, and my own, supplemented by observations of Messrs. E. and S. Criddle. I have also consulted the Reports of the Dominion Entomologist, Dr. James Fletcher, covering the period of 1895-1907. My personal association with grasshopper control work has enabled me to keep a fairly accurate record of the fluctuation of those insects, while the almost continuous residence at Aweme, Manitoba, of my brothers and myself since 1882 has ensured a reasonable appraisement of the comparative numbers of grouse present from year to year. That the records are only approximate is obvious and it is hardly necessary to add that the curves shown on the graph are based on approximations rather than actual numbers.

One interesting point brought out by this graph is that rainfall seems to be of far less influence in accounting for grouse fluctuation than is generally supposed. It will be noted, however, that the beginning of a grasshopper rise is nearly always preceded or accompanied by abnormally dry seasons but that having once risen well above their minimum numbers the further multiplication of these insects is then so rapid that precipitation becomes a minor factor in controlling them. The grouse, on the other hand, being able, in times of grasshopper abundance, to procure a sufficiency of food under any weather condition, rear the maximum number of young and so become plentiful in spite of excessive rainfall.

The question might be asked, by those unfamiliar with insect habits: If grasshoppers multiply irrespective of meteorological adversities, why do they ever sink to insignificance? To this we reply that most insect pests rise to importance



Graph showing fluctuations in grouse and grasshoppers at Aweme, Manitoba. Upper lines represent Sharp-tailed Grouse, the lower ones Ruffed Grouse and the broken ones grasshoppers. The lower columns show rainfall for the five months May-September the amount indicated by short projections on the left, each of which represents two inches.

during an absence of their natural enemies, but that these enemies eventually overtake and subdue them. Abundance means close contact and close contact is one of the greatest aids to the distribution of disease.

Referring again to our graph it will be observed that all the high points of Sharp-tailed Grouse abundance were preceded and accompanied by grasshopper outbreaks. Of these outbreaks the one of 1900-1903 was much the worst that we ever experienced in the Aweme district and it was not finally subdued until 1905. The peak of grouse abundance was also attained at this time and we have no records of Sharp-tailed Grouse ever being in greater numbers. The Prairie Chicken of the south, or what in Manitoba is more commonly known as the Pinnated Grouse, also reached its zenith in our province at that time. Referring to my note book I find under the year 1901: "Grouse very plentiful, there is hardly a female that did not rear a full brood of from 12 to 18 young." And in 1902: "Sharp-tails and Pinnated Grouse dancing everywhere (during the spring). They again reared full families."

The other two grasshopper outbreaks recorded on the graph did not attain the same heights in our district as the one referred to above although that of 1919-23 was more widespread and of greater intensity in other parts of the province.

A perusal of the available data prior to 1895 and back to 1882 shows that Sharp-tailed Grouse maintained a greater average number in those days than they did after that time. We note, too, that the oscillation since then seems to have taken a lower level; this is to be expected with the settling of the country and the subsequent restriction of the bird's breeding grounds by cultivation and grazing.

While grasshoppers are apparently necessary food for young Sharp-tailed Grouse, this is probably not true of the adult birds and in their case some other explanation seems necessary for their almost abrupt reduction from time to time. The failure to rear young would naturally produce a marked impetus to the downward trend, but it does not seem sufficient wholly to account for it and we suspect it is at this stage that disease comes most prominently into play. This phase of the question is still poorly understood. We also need to know more of the influence of Goshawks on a grouse population already depleted by other agencies. These hawks sometimes invade the grouse habitations in considerable numbers and it has been estimated that a single Goshawk may destroy fully 50 grouse in the course of a winter. Our records show that one such invasion took place during the winter of 1907-8. This hawk, however, is the only important predator with which we are concerned because, while crows undoubtedly take both eggs and young birds, their numbers are sufficiently stable to remove them from the causes of wild life fluctuation.

Perhaps I should add that the district of Aweme from which the above data were gathered has always been a favourite one for Sharp-tailed Grouse. Also that predators, with the exception of the Goshawk and Cooper Hawk, have never been molested there. This also applies to crows which rear their families unhampered by the persecutions to which they are subjected in other sections of the country.

The ups and downs in Ruffed Grouse fluctuation seem to be less affected by grasshopper prevalence than are Sharp-tailed Grouse and it will be noted that their oscillations are less abrupt. The latter fact is to be expected in a species which is relatively much less numerous. There does, however, seem to be some relation between the rise in grasshoppers and Ruffed Grouse, only in this case the birds have taken longer to respond to the rise of the insects. Here the explanation may lie in the fact that the broods of this grouse are much smaller. We must remember, too, that the species of grasshoppers which breed in, or close around, woodlands are few in comparison to those which do so in the open and on this account we should expect those insects to be of less importance to Ruffed Grouse than they are to the Sharp-tail. The food habits of all our grouse are still very imperfectly understood and a much more careful study of them is necessary before an accurate estimate of the value of insects in grouse survival can be made.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C CRITCHELL-BULLOCK

TRAVELLING CONDITIONS IN THE NORTHERN TREELESS PLAINS IN WINTER, AND THE NAVIGABILITY OF THELON RIVER

FROM the end of October until the beginning of June travelling conditions in the interior of the Canadian sub-Arctic are all that can be desired. The snowfall is slight but sufficient at all times, and only on rare occasions is the precipitation so heavy as to make going difficult. Out of two hundred and twenty days during those months it snowed apparently on about fifty occasions, and even then several of the days noted as snowing may only have appeared so on account of heavy drifting.

Rarely are snow storms unaccompanied by high winds, so that loose snow does not lie thickly distributed everywhere. On the lower ridges and along all the valleys in our vicinity there is sufficient vegetation in the form of moss and sedge to collect the snow and keep it at a uniform depth of about two inches. The prevailing winds are from the north, north-west, north-east, with an occasional blow from the south-east, hence all the narrow valleys running east and west become filled with hard packed snow, sometimes to a considerable depth.

Were the winds more moderate than they are and the temperature less uniformly low the surface of the snow would generally be even, though of course not so hard. As it is, however, the fierce winds cut the surface of these drifts into *sastrugi*, small, sharp ridges about six inches to a foot in height, rather in the form of ripples in the sand at the edge of the sea, only exaggerated. These ridges become as hard as rock and are analogous to an irregularly ploughed field that has been frozen. This condition may extend for miles where the country is covered in sedge, or in some broad valley where the snow lies deeper than elsewhere.

This sort of snow is very tiring to travel over. In winter when there is little daylight it becomes most irksome, and on those days when the light is so diffused that no shadow is cast it is more disconcerting. It is not practicable to wear snow-shoes to bridge the ridges as they would be broken, and walking without them occasions fall after fall.

The country is for the most part low-lying, but morainic ridges and eskers are constantly met with. The tops of these ridges and eskers do not however provide a solution to the difficulty, as not only do they usually run across one's line of travel instead of along it, but the tops of them are invariably blown clear of snow.

With a good leader to the team it is possible in clear weather to avoid the worst places, or if two men are travelling they can take in turns to run ahead and lead the way. This is what we invariably used to do. Frequent blizzards are an unpleasant feature of the country, and there are days in every month when nothing would induce a man to travel but dire necessity. A gale blowing from a different direction to that of the last causes more discomfort than a fiercer wind from the same direction. Such a wind will eat into the drifts laid down by the last storm, rip the snow into ribbons and whirl it away like sand to the valleys lying transverse to the direction of the wind. On such occasions it is folly to travel except for short distances, as one is not only likely to lose one's way, but even though a fight should be made against it all day, but a few miles in the required direction will be made at the expense of considerably more energy than would be expended in doubling the usual day's travel. To be lost in the treeless country of the sub-Arctic is far from a pleasant experience; snow-houses cannot be constructed except on rare occasions, and to be caught out entails digging into a snowdrift that may suddenly end against rock after a foot or two. Tents, as may well be imagined, would hardly stand against so fierce a storm when pegged out with nothing but the odd rotten stick one might be carrying, and in any case it would be almost impossible for a couple of men to erect one, certainly not the lone traveller.* The only thing to do is to lie down and curl up amongst the dogs.

The storms in the Northern Plains last either three or seven days, and for those periods they will blow with all the fury of the first day. Being caught out for a single night is a serious enough matter, but seven days without rest and shelter is not to be serenely contemplated. We travelled throughout the entire winter, but we were careful; we were only two and we could not afford to

[1]The Southern Party of the Canadian Arctic Expedition, 1913–18, evolved a light modified form of the R.G.S. "Alpine tent" which could be pitched by one or two men in any weather, wherever they could find a rock, log, stump, or block of ice to form one solid anchorage to windward. This could be carried on a toboggan. The dome-shaped tent of the Western Eskimos is habitually pitched in the open in every kind of weather.—R.M.A.

take unnecessary risks, one man's foolhardiness would compromise the other. Nevertheless there were occasions on which we had unpleasant experiences, and for a white man who is none too well-fed a single night out in the open in such a region is an experience to be avoided.

A large party can afford to take greater chances than a small one, the loss of one individual where several are concerned need not necessarily be a serious matter. Even frostbite does not seem so awesome when it is known that skilled treatment will be received on reaching camp. But where only two men are concerned, and when the success of the expedition depends on the ability of those two men to remain fit and do each their share of the daily chores, the whole matter receives a different light.

Travel in the interior, away from all source of fuel except that which can be picked up along the line of march, depends in distance on either one's ability to glean sticks, heather or moss from beneath the snow, or the facilities for carrying a sufficient supply.

The Inland Eskimos live without fuel in winter, or at least they used to, but little or no travelling is done and they keep to their sod built houses. For the whiteman bent on experiments in habitability this mode of existence may also be possible, but for him who wishes to move about and conduct investigations it is out of the question. Unnecessary risks cannot be taken by a small party, and should not be taken even by a party of considerable size.

The smallest of snow-shoes may be worn in the windswept country north of the timber limit, and during many days they may be dispensed with. Hornby, who suffered from tender feet, wore them only when absolutely forced to, probably only on thirty occasions. But he is a man lightly built and has large feet. I, weighing two hundred pounds, used to find that, being of very light construction, they were a great advantage. The only objection was that the patches of extremely hard and sharp snow would cut through the babiche and necessitate constant repairing. Practically any type of sleigh but the extremely heavy is good for winter travel in this region. We used the ordinary toboggan, and found that four dogs could haul a load of three or four hundred pounds for the distance of thirty miles a day with comparative ease.

In the fall before much snow has fallen, yet when the ground is frozen and the vegetation covered in frost, steel runners are essential and with them it is possible to commence sleigh work before the end of September. In Spring when the snow commences to leave the ground and ice, or when at night the late frosts sheet the snow with a hard crust they are again almost indispensible. In spring high runner sleighs are not necessary, the water on the small lakes does not flood the ice to a depth exceeding a couple of inches except at the sides, and an ordinary toboggan raised three inches will serve the purpose.

Apparently fresh meat is always procurable on the mainland during winter, as the caribou are scattered all over the country between the two periods of migration. Nevertheless during the cold weather they are not easy to approach, and until April do not show the foolish inquisitiveness about which so many have written. During the winter months the snow is hard and brittle, and every footstep is accompanied by considerable noise, and at this time of the year strange noises soon put the caribou on the run. It is important to avoid being winded or seen, then, provided the hunter can run on the snow under cover making with his feet the sound of the quick steps that the animals with their four feet do, he has every opportunity of coming within shooting distance. The reason for the caribou's vigilance at this time is difficult to determine, probably the intense cold has something to do with it keeping them restless; wolves also, as at this time of the year they are usually hungry and the caribou being aware of this fact are ever on the alert.

Accurate shooting in winter is more difficult than at any other time, principally because of the cold and the rapidity with which fingers become touched with frost. I know of nothing to disturb aim so entirely as fast freezing hands. The degree of discomfort however can be greatly lessened by the choice of rifle to be used. I saw six different types of rifles in use during the winter and the one with the flattest trajectory for the first five hundred yards, and the largest magazine capacity was far and away the most suitable weapon. I have used many rifles but I know of no stock rifle as efficient for Arctic use as the .280 Ross sporting model. Had it a larger magazine capacity it could not be excelled. We were fortunate enough to have one and on several occasions obtained with it game that we would not have contemplated shooting at with any of our other rifles. When using Winchester ammunition there was never any necessity to take a coarse sight for any distance less than five hundred yards.

Owing to the fact that one may, with reasonable certainty, depend on securing the required food with the rifle, and we found that the female caribou are sufficiently fat at this time of the year

to be fairly nutritious, the greater part of the sleigh may be utilized for the transportation of fuel. Fuel that will provide a maximum heat is essential as it would never be wise to depend on being able to build snow-houses. A tent would have to be carried and, as the winter wind will blow through any manufactured material, only a roaring fire would make it humanly habitable. The blizzard in the treeless plains is an affliction at the best of times, but a severe seven day's storm, if under no better cover than a porous tent and provided with insufficient fuel, would doubtless prove something of a danger, especially if experienced in some bleak spot where lack of drifted snow prevented the erection of a good wind-break. Although it is an undoubted fact that it must be an exceptionally bad spell of weather to lay an experienced and determined white man low, the fact must be remembered that few would be travelling the country in winter without any other purpose than to find out how much cold it is possible to withstand. Some scientific object of importance would be the reason for such a trip, and because nothing can be accomplished if continually fighting, and reduced by fighting, the inclemence of the exhausting weather, the wise traveller would take all precautions to ensure some measure of comfort. Not only should this viewpoint receive consideration, but there is also the game of the country to be conserved. A man constantly exposed to extreme cold, fast uses up all the vitality in his system and, once in a lowered physical condition the very fattest and most nutritious foods are required to set him on his feet again, keep his blood heat up, and enable him to carry on energetically. A spell of bad weather in a tent in an exposed situation, on practically a straight meat diet would seriously reduce him physically, so that in order to build up again it would entail selecting from the game shot nothing but the most nutritious and heat-giving portions. In this sorry plight he might be expected to favour but the tongues and heads, discarding what remained of the carcass except that used for dog feed.

In the interior of the Arctic and sub-Arctic continent temperatures are lower in winter than anywhere further north where the sea and large bodies of water have a moderating influence. Probably there are places in Canada where as low as 90° below zero fahrenheit would be registered, as near Verkhoyansk in Siberia, and to be camped in a tent under such circumstances would be decidedly undesirable. During the latter part of December, and throughout January and February very long periods of intense cold must be expected, with possibly but the difference of a degree or two for weeks on end. Only Eskimo clothing is suitable for wear, and even then the cold is difficult to withstand.

Christmas 1924 found me in a most unenviable position. The worst storm of my experience blew for seven days. For three days I was without fuel, and living on raw oatmeal and snow. Everything became frosted up, my beard and the edge of my sleeping bag a mass of ice; underfed, my blood temperature became lowered, and had I not been fortunate enough to find my way to another camp my position would have been critical. It served to show me that these plains are a hard country unless almost unlimited fuel is procurable.

We had some little difficulty with our dogs in the matter of housing them. In spite of the fact that these animals can withstand the most intense cold unimpaired, it is a tax on their strength to be forced to do so throughout an entire winter, and moreover any humane person dislikes seeing his faithful brutes shivering in the teeth of a raging gale. Could we have allowed them to wander about, and select their own dens much discomfort would have been saved them and ourselves considerable labour. But wolves were generally in the vicinity, we had too few dogs, and we could afford to take no risks, hence they were kept tied up. During a storm they would become so badly and rapidly snowed up that within an hour or so they would be lying on tops of mounds of snow that had risen to a height corresponding to the length of their chains. This would necessitate turning out and tying them elsewhere. Generally we built snow-houses for them, but if the entrances were closed they would not be content until they had fought their way outside and wrecked the whole construction. It did not matter whether we closed the entrances to their kennels, or whether the drifting snow did so. We never solved the difficulty.

Although March is a blustery month, travelling is good. The days are long, and it is possible to sit out and bask in the sun, provided one is in the lee and sufficiently well clad. Snow glasses have to be worn, and the cold wind combined with the strong sun blackens exposed portions of the skin in a surprising manner. Tent life is sufferable, but still fuel in large quantities is a boon, if not absolutely necessary. During March 1925 sixteen days brought high winds and low temperatures that turned us into our sleeping bags as soon as the fire died down. By this time however it should be possible always to find sufficient snow for snow-house construction, there are more drifts of the required consistency, and also there

is the daylight to permit them being looked for at the end of the day's journey, provided the storms are not so fierce that it is impossible to see the requisite distance.

In April, if there is sufficient fuel for cooking and, of course, food to be cooked, few anxieties need arise. A tent is comfortable and generally speaking there is no limit to the distance that can be covered during the day. With a good dog team and average weather a thousand miles would be no great achievement for the month. The caribou are everywhere in thousands, at least south of the Arctic Circle, and travelling is a pleasure. Above all, work of a scientific nature can be commenced without its entailing hardship. During 1924 there was only one day during this month that the temperature rose above freezing without dropping towards nightfall, and that was at the edge of the timber. Night travel may have to be adopted at any time during this month, but on the average only towards its end. Steel runners consequently have to be taken out of cache. Twenty hours travel a day may be depended on.

In May the snow commences to leave the ground rapidly, the maximum temperature is above freezing, and although it usually freezes at night there are no zero readings. Glare ice travel on the large lakes is perfect at night, and unlimited distances with tremendous loads can be covered provided dogs' feet are shod with tanned moose hide. Travel over the snow across country becomes confined to the low country where the drifting has been heavy, but the night crust is not to be depended on to bear heavy loads on runner sleighs. It was May that caused us much anxiety. We had an exceedingly heavy load on one sleigh with but three dogs to haul it, two canoes being included in the load. We started two weeks too late to commence with, and a few unexpected and heavy falls of snow greatly hampered us.

By May 26th cross-country travel off the ice was impracticable. What snow remained was hollow, and our feet and the sleigh broke through all the way. It necessitated double and treble tripping our loads.

The action of the sun and frost in Spring is such that during the daytime the surface of the snow melts, but the latent cold in the snow and ground beneath prevents thawing, and with the cool of evening and a drop in temperature below freezing this moist surface freezes like ice. Going in consequence is remarkably good, and is analogous to that secured on glare-ice. This is the ideal condition. Unfortunately a fall of snow, (and snow is to be expected), will limit activities where heavy loads are concerned as completely as at any other time. Again a heavy thaw during the day may not be succeeded by a sufficiently low temperature during the night to freeze the snow to the depth that the sun thawed it. Later the ground, and the vegetation, absorb heat beneath the snow, and the snow commences to thaw from the bottom up. The crust then formed is merely like a shell, all being emptiness beneath.

The snow that has thawed to water runs off the hills into the lakes and ponds, and, before the end of May all those of limited size are flooded to various depths by water. The larger lakes flood only at the sides, the small ones throughout their entire surface, and are a mass of slush. If any current is passing through a chain of lakes which because of their size are flooded, holes will rapidly open up in the ice, round holes varying from an inch or two to three feet across; these allow the water to drain off. The ice then gradually cracks and opens up. The larger lakes have about them moats of water varying in breadth according to their size and the area drained, say from twenty to a hundred feet broad. The ice in the centre of the lake rises because of the streams of water that trickle from the land and find a way below the ice of the lake, and bulge it; this rise in the surface of the centre of the lakes results in the shore ice being correspondingly low-lying, here the water forms. After a while, two or three weeks, this water thaws the shore ice and opens up leads. This process continues until the lake ice is surrounded by open water, the ice, except where it has grounded, being afloat.

Travelling may now be proceeded with either by sleigh across the ice or by canoe along the edge of the ice. As sleigh travel is more rapid it is still continued on large lakes until a few days before the ice actually goes out. On small lakes, however, especially where there are currents, it comes to an end rather sooner, a bad spot is struck and the load goes through; also where lakes are so small that canoes are in constant use for transporting supplies to the ice edge the continual loading and unloading, and sleigh tying becomes irksome. Then, unless the shore line is exceedingly irregular, sleigh travel finally ceases. Canoes are loaded and paddled or poled along the shore. It is a slow method of travelling however. A heavy wind will pile the ice against the promontories, floes break off and obstruct the channel, and bottom ice rises to threaten canoes with capsizing. In practice, one only travels to while away the time, or by reason of the necessity of making every mile possible in

the required direction. Eight to ten miles a day along the shores of small lakes is a good day's work, and a heavy one.

But, except for those few occasions on which it is necessary to wait for the water to eat through the ice and drain away, there is no period of the year when it is impossible to travel either by dog sleigh or canoe in the Northern Plains. Travelling may be no pleasure at times, but it is generally possible.

The Hanbury River is a treacherous stream, and J. W. Tyrrell, who surveyed it in 1900, does not lay sufficient emphasis on the fact either in his report or on the series of maps he prepared. All that can be said for it is that it constitutes the only canoe route known between the central lake system and the Thelon River.

The level at which the water is standing affects considerably the navigability of the river, or at least so it would appear, as Tyrrell has marked as "currents" (strong or swift) many places that should undoubtedly be noted as rapids.

The first instance of this is that constriction in the channel ten miles below Sifton Lake. It is marked as a strong current. Here the river passes round an island. The right hand channel is too shallow, and although the other might be run safely there would be an element of risk attached, especially as in the middle of it there is a great rock, to the right of which any canoe would be upset. Throughout the entire river care must be taken, and it is necessary for travellers to go ashore in many places before running certain waters.

Below Grove Rapids we found a cairn and post; it stands on the shore of the lake at the end of the portage. On this post were engraved the following words. "Lake Hanbury, Named 13th August, 1911, R. V. Radford, T. G. Street". Both these men were later murdered by Eskimos on Bathurst Inlet, and I trust that the lake to which the notice applies will receive the name they wished given to it.

About fifteen miles below Lake Hanbury there is another lake at an elevation of 1030 feet, and just before it Tyrrell has marked on his map the words "strong current". For two miles here the river should be carefully watched. On the southern shore near the eastern extremity of this lake there is an esker, whereon a little scrub spruce grows. At the foot of this esker there is an eddy in the stream, and fair whitefish and trout fishing is to be had. This lake I request should be named Cruikshank Lake, after J. R. H. Cruikshank, B.A., F.R.G.S., now of Pittsburg, a gentleman much interested in exploration and who has done much to improve existing maps in many parts of the world.

Another ten miles and a narrow gorge occurs through which the river runs. It is about a mile long and the river drops eleven feet in that distance. It is not marked as being a dangerous stretch of water on Tyrrell's map, but it is so in actuality, and it should be carefully inspected before being run. The channel is under the left hand cliff but half way down there are rocks that must be avoided at all cost. It is speculative whether it would be possible to ascend this portion of the river without being forced to portage.

The lake succeeding it I suggest should be named Lake Radford and Street. After this lake the river turns northward and after about fifteen miles eastward again. Here there is more swift water that should be inspected.

The series of falls and rapids that follow Sandy Lake constitute the most serious obstructions to navigation on the river. But at Ford's Falls the portage may be reduced from half a mile to three hundred yards by taking the opposite side of the river (left) to that chosen by Tyrrell.

Between Helen's Falls and the last falls on the river there is another gorge a mile in length. It is difficult to see how Tyrrell made a five hundred yards portage of this stretch of river, but with his large complement of expert canoemen to each canoe he was doutless enabled to run a portion of the gorge. This would be suicidal except with light loads and full crews.

At this time we were rather under-fed and inclined to take chances. Consequently we managed to make a fifty yards portage of Helen's Falls by running down to the brink, and lowering our loads and craft over the precipice immediately below the fall. This was safely accomplished, but lining the canoes down the left hand side of the gorge was, as it happened, far from a simple undertaking. The result was we almost lost the entire contents of one canoe, and our lives from a landslide that suddenly hurtled down on us from the cliff above. Fortunately, although we were not more than fifteen yards apart, it rushed into the river between us. The last reach of the Hanbury before joining the Thelon is the most beautiful piece of country between Artillery Lake and the sea, that is about Hawk Rock. There is exceptionally good fishing and although the scenery is not awe-inspiring as the Dickson Canyon may be, it is park-like, and dainty. It was the one spot on the river system travelled by us that I should like to return to. Unfortunately there are shoals and swift water at the mouth of Hanbury River, but once this bad stretch is passed the rest of the river would be navigable

for a powerful flat bottomed and engined launch. This shallow water might cause considerable difficulty with a heavy cargo, however.

The Hanbury river, though a comparatively good canoe route down stream with small loads, would prove a tremendous grind for any heavily laden party going up.

Thelon River starts off well and for several miles gives the impression that it is all that Tyrrell has reported it to be, navigable for river steamers and vessels of shallow draught for five hundred and fifty miles, except for two places just above Baker Lake.

I entirely disagree however. I have had considerable experience with power boats drawing from two to ten feet of water, and in them I have voyaged through many difficult waters, but for any boat drawing more than a foot and a half laden, and incapable of exceeding a speed of twelve knots Thelon River is not to be considered navigable.

About the only type of power it would be feasible to use on the river would be the aero-thrust motor. Then provided sufficient speed were atained under load even the rapids on the lower stretches of the river could be navigated

The rapids on the lower river do not constitute a menace to navigation except because of their swiftness. In all three of them there is sufficient water in the main channel to float a boat drawing more water than could be utilized on the river higher up, above where the Dubawnt comes in. A high-powered tunnelled boat might possibly get through if drawing not more than eighteen inches but it would be unwise to attempt the passage with a valuable cargo, until an experimental run up had been made.

The heaviest rapid on the river is that about five miles below Schultz Lake. It is about a mile long, and we made a portage after spending an entire day looking it over from both banks. It commences by falling over a shelf against which it first piles. The immediate fall is about a foot, but the water does not break. Studded along the shelf are several small islands forming about five distinct channels, only one of which however appears to be really deep, this is slightly to the North (left) of midstream.

For the next two thirds of a mile the channel runs obliquely towards the southern (right) shore the water breaking with its force. Here at the commencement of the last stretch the main part of the river rushes over and through heavy rocks against which the strongest hull would be destroyed. Swift and deep water in a broad channel is to be found between these rocks and the southern bank, deep water running to within a few feet of this bank for the remainder of the rapid. The rate of flow of this rapid was not determined, but the last portion of the rapid we ran in our large canoe, and I timed it that we took two minutes and a few seconds to travel about half a mile. As our safety in that particular portion of the rapid depended on our ability to keep considerable way on our canoe over and above the rate of flow of the water, I take it that the flow in the rapid is about eleven or twelve miles per hour. This rapid however, I believe not to constitute the greatest obstacle to navigation on the Thelon.

About four miles above it there is another rapid. When we were there, in late August there was much broken water in mid-stream and it was only possible to run it by hugging the right hand bank. This again is deep water, however, and as it is but two hundred yards long would not be difficult to navigate.

Possibly the worst stretch on the whole river is the rapid at the entrance to Baker Lake. It commences about four miles up from the mouth and is dangerous water for a mile and a half. The river is not particularly swift, although there is broken water in places running probably over seven miles an hour, but the danger lies in the curving nature of the channel and the numerous shoals. Although it is difficult always to choose the main channel when running down a broad river in a canoe, one takes good care to choose one almost as good, especially in rapid water where the slightest mistake may result in the loss of the entire outfit.

In this rapid I almost came to grief. I was leading in the small canoe, its load including myself weighing approximately seven hundred pounds. The sun was in my eyes and although I expected a rapid and was constantly standing up in order to see it in time, I did not observe rough water until within two hundred yards of it. At the time I was that distance also from either bank. It looked bad for my uncovered canoe, but there was nothing to do but paddle straight ahead for speed and hope for the best. I suppose I was fated to get through, as nothing beyond a scare and a little water in the canoe resulted.

After the first stretch of this rapid which is between high cliffs, the river broadens out over the delta deposits of shingle and boulders. It it much divided, and rocks and shoals either break the surface or almost do so at numerous places. Another half mile, and several shoals run transverse to the flow. Over these however a good deal of water sweeps, and often one is forced to cross the current obliquely in such a narrow channel that there is ever the danger of being

drifted on to one of the shoals before the edge of the shingle bar is passed and another change of direction made. During our passage we made no less than four such crossings in the last three quarters of a mile, and one's situation is analogous to paddling along a weather shore with a strong wind blowing, the tendency always is to be washed up on the beach with the whole force of the water piling on one. In one place there appears to be a very shallow stretch, and I took it for the main channel. It may not be so, but were my supposition correct no boat drawing more than a foot could pass over the shelf.

Stretches of river similar to this are to be found frequently on the great bend after Grassy Island, and even in our canoes we would touch bottom on occasions if just out of the channel. Fortunately these shallows are invariably where there is only shingle to ground on. Wherever the river cuts through granite or sandstone the water is swifter, but the channel being more confined is deeper, although jagged rocks protrude not infrequently.

For canoe work with heavy loads the river would be difficult to ascend, much tracking would have to be resorted to, and often where the water is most swift the banks are so precipitous as to make tracking far from simple.

The extent to which the river is navigable largely depends on the usage to which the river might be put as a transportation route. Whether to be used by large parties such as miners and investigators, or by individual trappers and adventurers.

We know that certain members of the latter fraternities are excellent rivermen. No matter how forbidding a river, so long as advantage can be taken of eddies, and provided the river is not a series of falls, these men, with a bridle for tracking, by poling and portaging will take an outfit up a stream that to the inexperienced would prove impassable. Were the Thelon in one of the Provinces the banks would be dotted with cabins of such as these. As it is, however, it is situated so far from railhead that the returns of a trapping venture could not be expected to defray the costs of getting in and out again.

The only parties likely to enter the valley would be scientists, Government employees, miners, personnel forming part of an aerial exploratory party detailed to establish bases, and so on. None of these would travel as does the trapper, alone with a large canoe or light scow, tracking and poling most of the way. They would be accompanied by assistants, have considerable supplies and make use of power boats. They should not be expected to have to travel in any other manner in fact. The first passage of Thelon River with such craft could not be expected to be other than something of an adventure, and, as likely as not, the party would not establish itself on the upper Thelon until the summer succeeding that on which the start was made.

Because of this fact it would seem advisable to send a winter's fuel supply with the party in case Beverly Lake and drift timber were not reached. Unless the party wintered at Chesterfield Inlet, so as to be able to make an early start on the river the following summer, an attempt to ascend in all probability could not be made until summer was well advanced. Now, even though the first portion of the river should present no difficulties, Schultz and Aberdeen Lakes, without any harbours whatever, must be considered treacherous for flat-bottomed craft and quite likely to prove snares to hurrying people. I saw a few very dangerous snags and reefs.

Neither Baker Lake, nor the mouth of Dubawnt River would be very far distant, the former to retreat to, and the latter to send to for fuel. But establishing on the spot to conduct winter researches seems preferable to retiring, as does having the fuel in hand, when the only alternative would be to go and hunt for it when the time might much better be occupied building sod houses for the winter and surveying the surrounding country, which, around the lakes, seems geologically interesting.

It is necessary to observe, that although doubtless the river could be ascended by craft drawing as little water as possible it cannot be said how long it would take to make the initial passage.

(To be continued)

ADDITIONS TO "BIRDS OF THE LINDSAY DISTRICT"

By J. A. MUNRO

IN *The Canadian Field-Naturalist* (Vol. 39, Nos. 3 and 4) Mr. E. W. Calvert published "A Preliminary List of the Birds of the Lindsay District, Ontario". The present writer was familiar with the Kawartha Lake Region, between Balsam Lake on the south and Big Mud Turtle Lake on the north, during the years 1901 and 1910 and again in September 1919 and October 1926. This region adjoins, and is similar in topography to, that covered by Mr. Calvert's paper. The present writer had considered preparing a list of the birds of Victoria County but as this now would be largely a duplication it was decided to record only those species that are additions to the published list together with what other data is considered of interest.

Colymbus holboelli. HOLBOELL'S GREBE.—On October 3rd, 1910, a satisfactory view was obtained of a single bird of this species while the writer was paddling across Silver Lake.

Uria lomvia lomvia. BRUNNICH'S MURRE.—A specimen mounted by Mr. James Moore of Coboconk was examined by the writer. This was said to have been picked up dead in Somerville Township, Victoria County, on March 29th, 1909.

Mergus americanus. MERGANSER.—Fairly common migrant in autumn. August 15th is the earliest date.

Lophodytes cucullatus. HOODED MERGANSER.—On June 15th, 1903, a female was seen on Silver Lake leading a brood of newly hatched young.

Aix sponsa. WOOD DUCK.—During the period 1901 to 1910 Wood Ducks were quite common on the Gull River north of Coboconk. In the fall of 1919 and again in 1926 the once well populated haunts of this species were searched in vain, not a single individual was encountered.

Oidemia perspicillata. SURF SCOTER.—On October 7th, 1901, five specimens were shot from a flock of twenty or more on Big Mud Turtle Lake. These were all immature birds.

Rubicola minor. AMERICAN WOODCOCK.—Not observed in 1919 or 1926 in localities which the species frequented in earlier years.

Falco columbarius columbarius. PIGEON HAWK.—An adult male seen close to Little Mud Turtle Lake on October 2nd, 1910.

Pandion haliaëtus carolinensis. AMERICAN OSPREY.—A pair nested yearly on the west side of Balsam Lake. The nest was last observed in the summer of 1904.

Phloeotomus pileatus abieticola. NORTHERN PILEATED WOODPECKER.—An adult male was taken by the writer close to the south end of Big Mud Turtle Lake on September 17th, 1910.

Loxia curvirostra minor. RED CROSSBILL.—On August 10th, 1908, a flock was seen extracting the seeds from green spruce cones close to the shore of Silver Lake. Two, apparently mated birds, were seen on May 22nd, 1909.

Pipilo erythrophthalmus erythrophthalmus. TOWHEE.—Although this species was looked for in all likely places it was not encountered in the Coboconk region until July 3rd, 1910, when a singing male was seen. On October 6th, 1926, two birds in first winter plumage were observed. It seems probable that this indicates a local northward extension of range.

Vireosylva philadelphica. PHILADELPHIA VIREO.—Two specimens taken near Little Mud Turtle Lake on September 9th, 1919.

Dendroica tigrina. CAPE MAY WARBLER.—A male in first winter plumage taken on August 21st, 1910; others observed. A second immature male was collected on September 4th, 1919.

Dendroica castanea. BAY-BREASTED WARBLER.—Immature birds were very abundant near Coboconk during the first two weeks of September, 1919.

BIRD NOTES FROM PARRY SOUND DISTRICT

By H. W. FAIRBAIRN

THE following notes were made during the summer of 1928 while the writer was attached to a field party of the Geological Survey of Canada. The area under consideration includes Monteith, Christie, and parts of adjacent townships, and is but a few miles north of the Muskoka Lakes. The C.N.R. Ottawa-Depot Harbour line cuts the area into two parts.

The observations to follow were made more

or less at random and are by no means complete. They may, however, give some information of interest concerning the distribution of certain species in a district which is well known to many people.

Podilymbus podiceps. PIED-BILLED GREBE.—Observed only once, on Horn Lake, but is probably a common species.

Gavia immer. COMMON LOON.—Several times young birds were seen to stick one leg out of the water at a seemingly impossible angle, but apparently no harm was done as the bird would resume its swimming immediately after. The species is present on all the lakes.

Larus argentatus. HERRING GULL.—Observed frequently on the larger lakes.

Mergus americanus. AMERICAN MERGANSER.—Seen occasionally on the Seguin River.

Anas rubripes. BLACK DUCK.—Only one specimen was observed.

Botaurus lentiginosus. AMERICAN BITTERN.—Common.

Ardea herodias. GREAT BLUE HERON.—A small rookery was found on an island in Clear Lake. There were four nests in each of two tall spruce rampikes, built at intervals of several feet above each other. The locality was visited after the breeding season, but to all appearances the topmost nest was the one most recently used. The lower ones became successively more dilapidated. This heron is quite common.

Rubicola minor. AMERICAN WOODCOCK.—Dr. Quirke flushed one bird during the early part of the summer. Mr. Malkin, a resident of Orrville, states that the woodcock is of regular occurrence here, but has never been common. Spreadborough, in Macoun's "Catalogue of Canadian Birds", has recorded the species from Bracebridge, 40 miles to the south. More data regarding the distribution of the woodcock in central Ontario would be of interest.

Actitis macularia. SPOTTED SANDPIPER.—Common.

Oxyechus vociferus. KILLDEER PLOVER.—Commonly found in the open settled country.

Bonasa umbellus. RUFFED GROUSE.—This bird has apparently increased in numbers of late years, for residents of the district say that it was seldom seen before the Game Laws were enforced.

Circus hudsonius. MARSH HAWK.—The most common hawk of the district. A young bird followed me for some distance one day, but eventually decided that I wasn't worth attacking and flew off.

Accipiter velox. SHARP-SHINNED HAWK.—Noted only once.

Accipiter cooperi. COOPER'S HAWK.—One observed in the vicinity of Bear Lake. It is to be hoped that neither of these two hawks is much more common than is indicated here.

Buteo borealis. RED-TAILED HAWK.—One was seen in the vicinity of Axe Lake at close enough range to make out the rufous tail.

Buteo lineatus. RED-SHOULDERED HAWK.—Fairly common.

Cerchneis sparverius. AMERICAN SPARROW HAWK.—This hawk was noted only once during the summer but may be commoner than this would indicate.

Pandion haliaëtus carolinensis. AMERICAN OSPREY.—Dr. Quirke observed one bird in the vicinity of Orrville.

Coccyzus erythrophthalmus. BLACK-BILLED CUCKOO.—Although more often heard than seen, the cuckoo is a common summer resident in this district. Its note is a very elusive quantity to follow due to its peculiar carrying power, and the bird itself is a master of the art of concealment.

Ceryle alcyon. BELTED KINGFISHER.—Common on all the streams and lake shores.

Dryobates villosus. HAIRY WOODPECKER.—Fairly common.

Dryobates pubescens. DOWNY WOODPECKER.—Common.

Sphyrapicus varius. YELLOW-BELLIED SAPSUCKER.—Next to the flicker, the sapsucker was the most common woodpecker of the district. In the "Catalogue of Canadian Birds" J. H. Fleming also has noted the abundance of these birds in Muskoka and Parry Sound Districts. One sapsucker which was noted had developed flycatching habits and would repeatedly dart away from his tree to make an aerial capture in the most approved flycatcher manner.

Chordeiles virginianus. NIGHTHAWK.—A nest was found on a gray gneissic rock where the young birds blended most perfectly with the banding of the rock. In August a flock of about twenty birds was seen one evening about sunset.

Chaetura pelagica. CHIMNEY SWIFT.—Occurs regularly but does not seem to be abundant.

Archilochus colubris. RUBY-THROATED HUMMINGBIRD.—Common.

Tyrannus tyrannus. KINGBIRD.—Common.

Myiarchus crinitus. CRESTED FLYCATCHER.—Observed several times in the heavy timber.

Sayornis phoebe. PHOEBE.—Occurs regularly but is not abundant.

Nuttallornis borealis. OLIVE-SIDED FLYCATCHER.—Noted several times in burned country.

Myiochanes virens. WOOD PEWEE.—Common.

Empidonax trailli. TRAILL'S FLYCATCHER.—One was seen at Bear Lake. The call note was distinctive.

Empidonax minimus. LEAST FLYCATCHER.—This is probably the commonest flycatcher of the area.

Cyanocitta cristata. BLUE JAY.—Abundant.

Corvus brachyrhynchos. AMERICAN CROW.—Common only in the vicinity of the settlements.

Dolichonyx oryzivorus. BOBOLINK.—Nesting at Bear Lake in July. Fleming has noted it as uncommon in this district. As more land is opened up it may become more common.

Molothrus ater. COWBIRD.—Common.

Agelaius phoeniceus. RED-WINGED BLACKBIRD.—Common in the marshes.

Sturnella magna. MEADOWLARK.—Common in the cleared land around Orrville. Its numbers have evidently increased of late years for Fleming has reported it as rather uncommon here.

Icterus galbula. BALTIMORE ORIOLE.—One male, with several females and juveniles was seen at Orrville late in August. The district seems to be suitable for them as far as the hardwood bush is concerned, but nevertheless they seem to be uncommon here.

Quiscalus quiscula aeneus. BRONZED GRACKLE.—Common.

Carpodacus purpureus. PURPLE FINCH.—Common.

Passer domesticus. HOUSE SPARROW.—A few were seen in the neighbourhood of the villages.

Astragalinus tristis. AMERICAN GOLDFINCH.—Common.

Pooecetes gramineus. VESPER SPARROW.—Abundant.

Zonotrichia albicollis. WHITE-THROATED SPARROW.—Abundant.

Spizella passerina. CHIPPING SPARROW.—Fairly common.

Junco hyemalis. SLATE-COLOURED JUNCO.—Abundant.

Melospiza melodia. SONG SPARROW.—Abundant.

Hedymeles ludovicianus. ROSE-BREASTED GROSBEAK.—This species was fairly common here.

Piranga erythromelas. SCARLET TANAGER.—During the early part of the summer the tanager was seen very commonly in all the hardwood country.

Petrochelidon lunifrons. CLIFF SWALLOW.—Fairly common.

Hirundo erythrogastra. BARN SWALLOW.—Common at all the settlements.

Iridoprocne bicolor. TREE SWALLOW.—This is the most common swallow.

Riparia riparia. BANK SWALLOW.—Found nesting in most of the steep gravel hillsides.

Bombycilla cedrorum. CEDAR WAXWING.—Abundant in late summer.

Vireosylva olivacea. RED-EYED VIREO.—A common species and one of the most persistent songsters of the woods.

Lanivireo solitarius. SOLITARY VIREO.—A male was seen early in July.

Mniotilta varia. BLACK AND WHITE WARBLER.—Observed only once during the summer.

Dendroica aestiva. YELLOW WARBLER.—A common warbler. Migration takes place early, for none were seen after August 1st.

Dendroica coronata. MYRTLE WARBLER.—Fairly common.

Dendroica magnolia. MAGNOLIA WARBLER.—More common than the Myrtle Warbler.

Dendroica pennsylvanica. CHESTNUT-SIDED WARBLER.—Fairly common.

Dendroica fusca. BLACKBURNIAN WARBLER.—Common.

Dendroica virens. BLACK-THROATED GREEN WARBLER.—Found commonly in the thickest bush and is a very persistent songster.

Seiurus aurocapillus. OVENBIRD.—A common species and also a very persistent songster.

Oporornis philadelphia. MOURNING WARBLER.—Found several times in scrubby undergrowth in early July.

Geothlypis trichas. MARYLAND YELLOWTHROAT.—Commonly found in the alder thickets.

Wilsonia canadensis. CANADA WARBLER.—Fairly common.

Setophaga ruticilla. AMERICAN REDSTART.—Common.

Dumetella carolinensis. CATBIRD.—Fairly common.

Toxostoma rufum. BROWN THRASHER.—Occurs regularly throughout this district. Fleming has noted very few records of the species, but with the opening up of more land it has probably increased in numbers since that time.

Troglodytes aedon. HOUSE WREN.—Common.

Nannus hiemalis. WINTER WREN.—Frequents black spruce swamps quite commonly. It has a very powerful voice for such a diminutive bird.

Penthestes atricapillus. BLACK-CAPPED CHICKADEE.—Abundant.

Hyocichla fuscescens. WILSON'S THRUSH.—Common.

Hylocichla guttata. HERMIT THRUSH.—Common everywhere.

Planesticus migratorius. AMERICAN ROBIN.—Abundant.

Sialia sialis. BLUEBIRD.—Occurs regularly but is never abundant.

In conclusion, mention should be made of *Phasanius colchicus torquatus*, the Ring-necked Pheasant. The writer learned on good authority from Mr. Malkin, of Orrville, that a few Pheasants were found in this neighbourhood until about three years ago. Individual birds fed occasionally with the poultry on a farm at Lake Isabella, but they were very wary and difficult to approach. The discovery of a few of the long tail feathers later on seems to be the last trace of them known to this neighbourhood and nothing could be learned concerning the time and circumstances of their introduction. In the September, 1928, issue of *The Canadian Field-Naturalist*, Hoyes Lloyd, in a review of the present Pheasant situation, makes no mention of the bird in Ontario except in the southern parts of the province. The writer submits this additional information, therefore, with the hope that more evidence will be forthcoming concerning the northern distribution of this interesting species.

MARINE CRUSTACEA, MALACOSTRACA AND PANTOPODA (PYCNOGONIDA), COLLECTED IN THE GULF OF ST. LAWRENCE, NEWFOUNDLAND AND THE BAY OF FUNDY IN 1919, 1922, 1923, 1925 and 1926

By FRITS JOHANSEN

INTRODUCTION

THE following specimens collected by me during vacation trips in eastern Canada, have been kindly identified in the U.S.N.M., Washington, D.C., viz:—The Decapods, Pantopods and Schizopods by M. J. Rathbun and W. L. Schmitt; the Amphipods by C. R. Shoemaker; and the Isopods by M. O. Maloney. In return some of the duplicate specimens have been retained by the U.S.N.M.

In 1919 I went by steamer from Quebec City, along the north shore of the Gulf of St. Lawrence to Harrington, Que., and back, the occasional stops giving opportunities for shore-collecting.

In 1922 I was on the east side of Gaspé Peninsula at Charlottetown, P.E.I., and on the east and west sides of Newfoundland, sailing or collecting from the shore.

In 1923 I went by steamer along the north shore of the Gulf of St. Lawrence to Anticosti Island and back. I circumnavigated this island in a sail boat, and made shore collections at the various places.

In 1925 I was on a bicycle trip along the east coast of New Brunswick from Chaleur Bay to Miscou Island and Chatham collecting along the shore. I also spent some time in a fishing boat in the Bay of Chaleur, visiting its north side.

In 1926 I continued my bicycle trip along the south side of the Gulf of St. Lawrence, from Chatham, N.B., to Pictou, N.S. (including the western end of Prince Edward Island), and along the east side of the Bay of Fundy, from Windsor to Yarmouth, N.S., making shore collections at many places.

A number of notes and articles dealing with the natural history observations and collections made on these five trips of mine, have appeared in *The Canadian Field-Naturalist* from 1920 to date, and more may follow in the future.

In the following list of Crustacea, the records (localities) are arranged approximately from west to east, under each species.

To the records are added a few specimens (also identified at the U.S.N.M.) collected by others in the area in question and sent to me; and one collection by myself in the Gulf of St. Lawrence in 1927, secured on my way to Hudson Strait.

The number in brackets after each record means the number of specimens.(*)

Except when otherwise stated, the specimens are all from beach or shore water.

DECAPODA

Neopanope texana Sayi (Smith)

Under stones at low tide, Geddes Point, Buctouche, N.B., September 1, 1926 (1).

Cancer irroratus Say

Dalhousie, N.B., end of August 1925.

Maria, N.-side of Chaleur Bay, Que., Aug. 25, 1925.

Cape Ozo, Gaspé Bay, Que., August 10, 1922.

Shippigan, N.B., September 8, 1925.

North end of Miscou Island, N.B., Sept. 11, 1925.

Escuminac Point, N.B., end of Aug. 1926 (also some post-larvæ).

Richibucto Head, N.B., August 30, 1926.

Geddes Point, N.B., September 1, 1926.

Cape Bald Harbour, N.B., September 7, 1926.

Cape Tormentine, N.B., September 10, 1926.

Pugwash Harbour, N.S., September 19, 1926.

Ellis Bay, W.-end of Anticosti Island, end of July 1923.

*Under the very common species the numbers are omitted.

Fox Bay, N.E.-side of Anticosti Island, August 6th, 1923.

Port au Port, W.-coast of Newfoundland, beginning of September 1922.

Kelligrews (Conception Bay), E.-coast of Newfoundland, August 26th, 1922.

Hyas araneus (L.)

From cod stomachs, Bay of Chaleur, August 20–25, 1925, 15–20 fathoms (1).

From cod stomachs, Abrahams Cove (Bay St. George), W.-coast of Newfoundland, September 6, 1922 (10).

Hyas coarctatus alutaceus Brandt

Savoy Landing, S.-end of Shippigan Island, N.B., September 10, 1925 (1).

Escuminac Point, N.B., end of August 1926 (2).

Gulf of St. Lawrence (lat. 51°N., long. 58°W) July 20, 1927 (from cod stomach).

Chionocoetes opilio (O. Fabr.)

Cape Ozo, Gaspé Bay, Que., August 10, 1922 (1).

Pagurus acadianus Benedict

Geddes Point, N.B., September 1, 1926 (2).

Pugwash Harbour, N.S., September 19, 1926 (1).

Halls Harbour, N.S., (Bay of Fundy), October 4, 1926 (6).

Pagurus pubescens Kroeyer

Cod stomachs, Bay of Chaleur, 15–20 fathoms. August 22–25, 1925 (3).

Pagurus Kroeyeri Stimpson

Cod stomachs, Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (3).

Homarus americanus M.-Edw.

Escuminac Point, N.B., August 21–23, 1926 (1).

Ellis Bay, Anticosti Island, August 11, 1923 (1).

Crago septemspinosa (Say)

Dalhousie, N.B., end of August 1925.

Outlet of Eel River, 4 miles east of Dalhousie, N.B., August 30, 1925.

North side of Heron Island, Chaleur Bay, August 22, 1925.

Maria, north side of Chaleur Bay, Que., August 23, 1925.

Barachois at Port Daniel, Gaspé Peninsula, Que., August 9, 1922.

Creek-outlet at Shippigan, N.B., September 9, 1925.

Creek-outlet at Mal Bay, north end of Miscou Island, N.B., September 12, 1925.

Tracadie, N.B., September 17, 1925.

Escuminac Point, N.B., August 21–23, 1926.

Richibucto Harbour, N.B., August 27, 1926.

Buctouche, N.B., August 31, 1926.

Ellis Bay, Anticosti Island, August 12, 1923.

Malpeque Bay (west side) P.E.I., September 13, 1926.

Cape Tormentine, N.B., September 10, 1926.

Port au Port, Newfoundland, beginning of September 1922.

Nectocrangon dentata Rathb.

Cod stomachs, Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (17).

(probably) *Pandalus borealis* Kroeyer

Gulf of St. Lawrence (lat. 51°N., long. 58°W.) July 20, 1927 (cod stomach).

Pandalus montagui Leach

Cod stomachs, Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (1).

Spirontocaris spina (Sowerby)

Cod stomachs, Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (1).

(?) *Spirontocaris gaimardii* (M.-Edw.)

Cod stomachs, Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (1).

Spirontocaris gaimardii (M.-Edw.)

Halls Harbour, N.S., October 4, 1926 (1).

SCHIZOPODA

Michtheimysis stenolepis Smith

Dalhousie, N.B., end of August 1925.

Outlet of Eel River, 4 miles east of Dalhousie, N.B., August 30, 1925.

Gaspé Basin, Quebec, July 12, 1923, J. D. Soper coll.

Shippigan Harbour, N.B., September 15, 1925.

Escuminac Point, N.B., August 21–23, 1926.

Freeland, north side of Prince Edward Island, September 14, 1926.

West side of Malpeque Bay, P.E.I., September 13, 1926.

Pictou Harbour, N.S., September 22, 1926.

Westbay, Port au Port, Nfld., September 3, 1922.

Picadilly, Port au Port, Nfld., September 5, 1922.

Mysis oculata (Fabr.)

Ellis Bay, Anticosti Island, July 30, 1923 (6)

From stomach of *Microgadus tomcod;* same place, August 12, 1923 (11).

ISOPODA

Idothea baltica (Pallas)

North side of Heron Island, Chaleur Bay, N.B., August 22, 1925 (1).

Creek outlet at Mal Bay, Miscou Island, N.B. September 12, 1925 (1).

Escuminac Point, N.B., August 21–23, 1926 (4).

Richibucto Harbour, N.B., August 27, 1926 (1).

Geddes Point, N.B., September 1, 1926 (1).

Cape Tormentine, N.B., September 10, 1926 (4).

English Bay, west-end of Anticosti Island, August 4, 1923 (from sculpin stomach) (1).

Ellis Bay, Anticosti Island, August 12, 1923 (4).

Idothea sp. (probably *ochotensis* Brandt)

Shippigan Harbour, N.B., September 15, 1925 (2).

Synidothea bicuspida (Owen)

Attached to sponges, Hydroids, etc., Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (2).

Chiridothea coeca (Say)

Scott Bay (Blomidon, Bay of Fundy), N.S., October 2, 1926 (many).

Iaera Marina (Fabr.)

Under stones at Escuminac Point, N.B., August 21–23, 1926 (several).

Under stones at low tide, Quidi Vidi, St. Johns, Nfld, August 25, 1922 (many).

Aega psora (Linn.)

From cod, Northwest Cove, mouth of Codroy River, S.W. end of Newfoundland, June 1925, A. English coll. (1).

AMPHIPODA

Anonyx nugax (Phipps)

Cod stomachs, Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (4).

Cod stomach, Gulf of St. Lawrence (lat. 51°N., long. 58°W.), July 20, 1927.

Pardalisca abyssi Boeck

Cod stomach, Gulf of St. Lawrence (lat. 51°N., long. 58°W.), July 20, 1927.

Rhachotropis aculeata (Lep.)

Cod stomachs, Gulf of St. Lawrence (lat. 51°N. long. 58°W.), July 20, 1927.

Calliopius laeviusculus (Kroeyer)

Off English Bay, Anticosti Island, August 4, 1923, (pelagic; many).

Ellis Bay, Anticosti Island, Aug. 12, 1923, (from stomachs of *Urophycis;* 2).

Among algae growing on pier at Port Daniel, Quebec, August 8, 1922 (1).

Eskimo Point, N.-shore of Gulf of St. Lawrence Que., August 1919 (many).

Escuminac Point, N.B., August 21–23, 1926 (1)

Westbay, Port au Port, Nfld., September 2, 1922 (pelagic; 1).

Torbey, E.-end of Newfoundland, August 28, 1922 (4).

Kelligrews (Conception Bay), Nfld., August 26, 1922 (many; also from sculpin-stomach here).

Pontogeneia inermis (Kroeyer)

Among algae on pier at Port Daniel, Que., August 8, 1922 (4).

Gammarus annulatus Smith

Creek-outlet at Belledune Point, N.B., September 4, 1925 (1).

Gammarus locusta (Linn.)

Tadoussac, Que., August 1919 (North shore Gulf of St. Lawrence).

Clark City, Que., August 1919 (North shore Gulf of St. Lawrence).

St. Anne de Monts, Que. (South shore of Gulf of St. Lawrence), August 3, 1922.

St. Helier (Grand Etang), Gaspé, Que., August 15, 1922.

Dalhousie, N.B., end of August, 1925.

Outlet of Eel River, 4 miles east of Dalhousie, N.B., August 30, 1925.

Belledune Point, N.B., September 4, 1925 (Creek-outlet).

Miscou Point, Miscou Island, N.B., September 12, 1925.

Escuminac Point, N.B., August 21–23, 1926.

Richibucto Harbour, N.B., August 27, 1926.

Geddes Point, N.B., September 1, 1926.

English Bay, Anticosti Island, August 4, 1923 (from sculpin-stomach).

Ellis Bay, Anticosti Island, August 12, 1923 (also from fish stomachs here).

Eskimo Point, Que., August 1919 and July 27, 1923.

Cape Tormentine, N.B., September 10, 1926.

Scott Bay, (Bay of Fundy), N.S., October 2, 1926.

Westbay, Port au Port, Nfld., September 3, 1922.

Kelligrews, Nfld., August 26, 1922 (also from sculpin-stomach here).

Torbey, Newfoundland, August 28, 1922.

Quidi Vidi, Newfoundland August 25, 1922.

Gammarus locusta (?)

Pond at Avonport (Minas Basin), N.S., September 30, 1926 (6).

Carinogammarus mucronatus (Say)

Lagoon at Port Daniel, Que., August 9, 1922 (2).

Pond at Avonport, N.S., September 30, 1926 (1).

Eurystheus sp.

Halls Harbour (Bay of Fundy), N.S., October 4, 1926 (1).

Orchestia grillus Bosc.

Head of St. Mary's Bay (Bay of Fundy), N.S., October 10, 1926 (together with Oniscoidea: see *Canadian Field-Naturalist*, 43: 106, 1929, many).

Amphitoe rubricata (Montagu)

Among algae on pier at Port Daniel, Que. August 8, 1922 (1).

Corophium cylindricum (Say)

Bay St. George, W.-coast of Newfoundland, September 7, 1922 (2).

Ischyrocerus sp.

Torbey, Newfoundland, August 28, 1922 (2).

Aeginella longicornis (Kroeyer)

Cod stomachs, Bay of Chaleur, 15–20 fathoms, August 22–25, 1925 (6).

Caprella linearis (Linn.)

Scallop-beds in Chaleur Bay, 14–15 fathoms, gravel-bottom, dredge, August 26, 1925 (on Hydroids, etc.) (5).

Caprella septentrionalis Kroeyer

Among algae on pier at Port Daniel, Que. August 8, 1922, (many).

PANTOPODA (PYCNOGONIDA)

Phoxichilidium femoratum (Ratke)=

P. Maxillare Stimpson

Attached to algae and Hydroids, pier at Charlottetown, P.E.I., August 22, 1922 (10).

OUTSIDE NESTS OF FLYING SQUIRRELS

By JAS. L. BAILLIE, JR.

ALTHOUGH preferring hollow trees or stubs and deserted woodpecker nests for nesting purposes, both species of North American Flying Squirrels have been known to build outside nests in which to raise their young or pass the winter.

Snyder[1] has recorded such a nest, found at Point Pelee, Ontario in 1920, used by the small Eastern Flying Squirrel (*Glaucomys v. volans*) and Howell, in his *Revision of the American Flying Squirrels*[2] mentions other instances of the same habit and further states that this species will, at times, utilize other squirrels' nests.

On April 3rd, 1921, some boys found an outside nest of a flying squirrel (probably *volans*) in the Don Valley, Toronto, and the nest was seen by Mr. T. B. Kurata later. It was composed of small sticks and was placed fifteen feet up in a cedar in a growth of scattered cedars on a farm.

The only other local evidence of this habit came to light on December 18, 1926, when some boys found a nest of this species, sixty feet up (against the trunk) in a cedar tree in a dense pine grove at Dentonia Park, Toronto. This nest, which is now in the Royal Ontario Museum of Zoology is composed of soft materials (mostly cedar-bark shreds) with the entrance-hole at one side. The nest measured thirteen inches in width and sixteen inches in height.

At King township (thirty miles north of Toronto) a Northern Flying Squirrel (*Glaucomys sabrinus macrotis*) was disturbed from an outside nest in a balsam tree by a farm boy who was cutting "Christmas trees" in December 1929. This nest was shown to Professor A. F. Coventry and the writer on December 30, was a bulky spherical affair (about eighteen inches across) and was composed of moss and cedar-bark strips. It was located in a dense balsam and cedar wood, being situated twenty-five feet from the ground and approximately two feet out from the trunk. In the same tree another nest of similar construction was found but it was uninhabited at the time. Examination of the occupied nest revealed two Flying Squirrels and one of these, a male, was collected. The specimen proved to be *G. s. macrotis* (as did also the two previous specimens we have taken in King township).

Our first two specimens were found in old woodpecker holes in dead stubs, the usual location of the Flying Squirrel's home. On another occasion, April 2, 1927, one was found in a Flicker box that had been placed in a tree near our cabin. Years ago Mr. J. H. Ames saw a nest of a flying squirrel (*volans*) that had been built in a Flicker box. The young were reared successfully. This was at North Toronto.

Mr. Holton B. Haugh informs me that he has found flying squirrels (*macrotis*) at Little Lake, Barrie, by disturbing them from bulky nests in spruce trees and Howell (*loc. cit.*) cites three instances of this northern species occupying moss- and stick-constructed outside nests in coniferous trees but it is not the usual habit of either species.[3]

[1]Journal of Mammalogy, 2: 171, 1920.
[2]North American Fauna, No. 44, 1918, p. 7.

[3]The writer found a specimen of *G. s. macrotis* occupying a nest (about 8 feet from ground) in a thickly branched white Cedar in the outskirts of Hull, Quebec, in the month of May.—R.M.A.

NOTES ON THE SUMMER BIRDS OF THE INTERIOR OF WESTERN NOVA SCOTIA

By A. L. RAND, Laboratory of Ornithology, Cornell University

THE following notes were made during the summers of 1927 and 1928 while at Annapolis Royal Camp for Boys which is eighteen miles south of Annapolis Royal on Fisher's Lake, one of the Liverpool chain.

Numerous canoe trips were made along the headwaters of this chain and it was on these trips that many of the notes were made. The lakes mentioned belong to this system of waterways. The general area is the drainage basin of the headwaters of the Liverpool River.

The country has few clearings. It consists of coniferous forests and sphagnum swamps in the valleys, and hemlock and hardwood forests on the ridges. Much of the forest has been burned, giving extensive barrens growing up to bushes.

The following boreal types were among the common summer birds of the region.

Black-backed Gull; Spruce Grouse; Olive-sided Flycatcher; Yellow-bellied Flycatcher; Canada Jay; Rusty Blackbird; Myrtle Warbler; Yellow Palm Warbler; Acadian Chickadee; Golden-crowned Kinglet; Olive-backed Thrush;

Less common boreal birds found as summer residents were Pine Grosbeak; Ruby-crowned Kinglet.

Many other less northerly types were fairly common such as: Loon; Merganser; Goshawk; Yellow-bellied Sapsucker; Pileated Woodpecker; Alder Flycatcher; Raven; Solitary Vireo; Black-throated Blue Warbler; Magnolia Warbler; Blackburnian Warbler; Black-throated Green Warbler; Water-thrush; Canada Warbler; Winter Wren; Brown Creeper; Red-breasted Nuthatch; Hermit Thrush.

Other species with widespread distribution, especially southward, are equally common: Black Duck; Great Blue Heron; Woodcock; Spotted Sandpiper; Ruffed Grouse; Marsh Hawk; Sharp-shinned Hawk; Red-tailed Hawk; Sparrow Hawk; Osprey; Barred Owl; Chimney Swift; Ruby-throated Hummingbird; Least Flycatcher; Blue Jay; Crow; Song Sparrow; Swamp Sparrow; Cliff Swallow; Barn Swallow; Tree Swallow; Red-eyed Vireo; Great-horned Owl; Kingfisher; Hairy Woodpecker; Downy Woodpecker; Flicker; Nighthawk; Black and White Warbler; Parula Warbler; Chestnut-sided Warbler; Ovenbird; Maryland Yellow-throat; Redstart; Black-capped Chickadee.

Less common Transition Zone birds observed were: Bittern; Mourning Dove; Bald Eagle; House Sparrow; Chipping Sparrow; Yellow Warbler; Catbird; Veery.

The following are of especial interest in establishing definite records of occurrence or nesting:

Philohela minor—WOODCOCK.—The Woodcock is a fairly common summer bird. They were present in nearly every suitable swamp.

Zenaidura macroura—MOURNING DOVE.—On August 18, 1928, one lit on the tennis court at the camp. The bird occasionally occurs in the Province in the fall but this is an early date and its appearance in a wooded region such as this was unexpected.

Haliæetus leucocephalus—BALD EAGLE.—A beautiful adult with white head and tail appeared over camp on August 20, 1928. It is fairly common along the "South Shore" of Lunenburg and Queens Counties in the winter but I know of no nest in this part of the country. Occasionally a nest is reported but it always proves to be that of the Osprey.

Pinicola enucleator—PINE GROSBEAK.—This bird nested in the extensive spruce areas to the north of Bear Lake in 1927 and 1928. Here on August first, second and third, there were several short-tailed young accompanied by an adult. They could not have travelled far from the nest. On August 18, 1928, I collected a fully feathered immature male in the same locality.

Dumetella carolinensis—CATBIRD.—A pair were feeding their young on an island in Fisher's Lake, July 25, 1927. This is a Transition Zone bird quite common in the Annapolis Valley, but to find it breeding amid such Canadian surroundings was surprising.

Nannus hiemalis—WINTER WREN.—The Winter Wren is a regular but uncommon summer resident throughout this region. On August 3, 1928, I found a nest in the up-turned stump of a hemlock in a cool moss-grown hemlock wood.

Hylocichla fuscescens—VEERY.—At Fisher's Lake in both 1927 and 1928 there were at least four pairs present that probably bred there. On July 22, 1927, I found a nest in a low brushy area near the lake. It was in a spruce near the ground and contained four young. I heard a Veery singing on June 27, 1928, some four miles

northwest of South Brookfield, which probably represented another pair.

This bird is rather irregular in Nova Scotia and, with so wide a range to the south, it is interesting that it should become established in such a typically Canadian locality and be absent from the Transition Zone in the Annapolis Valley.

NOTES AND OBSERVATIONS

THE NORTHERN LIMIT OF THE WHITE-TAILED DEER IN ONTARIO.—It is generally known that the white-tailed deer (*Odocoileus virginianus*) has been gradually extending its range northward in Ontario, but little definite informaton as to its northern limit at different periods is on record. This note is published with the idea of stimulating others to record information on this subject.

About two years ago Mr. J. C. Swartman informed the writer that during the winter of 1926–27, two specimens of this deer had been killed at Newpost on the Abitibi river. This point is a little more than one hundred miles south of Moose Factory on James Bay.—J. R. DYMOND, *Royal Ontario Museum of Zoology.*

LEWIS WOODPECKER IN WINNIPEG, MAN.—On Sunday, November 17th, 1929, I observed a Lewis Woodpecker flying about the trees close to the buildings of the Agricultural College.

When I had satisfied myself as to the identity I got in touch with the President of the Natural History Society, A. G Lawrence, who together with Mr. Broley, came out to see it the same afternoon. Since then it was under more or less constant observation by the bird students of Winnipeg; Mr. T. Shortt, a bird artist of Winnipeg even making a sketch, in the field, for the Tribune.

It spends its nights and in cold weather the greater part of its days in a hole in a pole.

To H. Mossop of St. Vital belongs the credit of first observing the Lewis Woodpecker in Manitoba. He having identified one at the Canoe Club property on October 24, 1929.

Our bird may be the same individual.—ROBERT M. BLAKELY.

WINTER OBSERVATIONS, GUELPH, ONT.—It will perhaps be of interest to your readers to learn that on November 23rd, 1929, about ten miles from Guelph the writer saw a flock of six Bohemian Waxwings, and on December 15th, inside the City of Guelph, twenty-five or more Pine Grosbeaks. Both species were carefully observed and positively identified; was the advent of these boreal visitors caused by the unusually early severe, winter weather?—HENRY HOWITT.

WHY THE FIELD SPARROW HAS BECOME SCARCE.—I read with interest the letter of Mr. James Baillie, Jr., in *The Canadian Field-Naturalist* for January, alluding to the scarcity of Field Sparrows at Toronto. I would like to suggest that their disappearance may be due, partly at any rate, to the cutting down and clearing away of light woods on the outskirts of the city where these birds are found.

In Hamilton there are but two places to my knowledge where Field Sparrows nest in any numbers. These are the Colquhoun woods on the Mountain and the Chedoke woods west of the golf links. Here in the scrubby pastures and among the thorn trees, their sweet trilling can be heard throughout the summer months.

Bradford Torrey in his delightful book *Birds in the Bush* after describing the usual song of the Field Sparrow, gives also a description of it sung in reversed order, and mentions this as unusual. This may be so in the White Mountains where his description was written, but here in Hamilton this form of the song is often heard in either of the woods I have mentioned.

Bird lovers of this district are wondering what will become of the Field Sparrow when the Colquhoun woods are cleared to make way for the scenic highway and the beautiful Chedoke woods are cut down to allow the golf links to be extended.—ANNA E. MACLOGHLIN.

BOOK REVIEWS

DEAM, CHARLES C.—*Grasses of Indiana; 356 pages, with 86 plates, 23 figures in the text and 216 quarter-page maps. Cloth, 10¼ x 7¼ inches in size. State of Indiana Department of Conservation, Division of Forestry. Publication No. 82, Indianapolis, Ind., 1929.*

Grasses on the whole, constitute a group of plants comparatively difficult to identify and to understand, taxonomically, particularly to students who are not intimately conversant with the homology between their organs and those of other flowering plants, and with the names which

are applied to the various parts of the grass plant. The difficulties in the taxonomic study of grasses encountered by the average student are, in "Grasses of Indiana", in quite a large measure removed by an article on "The Grass Plant", by Paul Weatherwax, which precedes the descriptive part of the book by C. C. Deam himself. In this article a brief, clear, and concise account of the structure of the various parts of the grass plant is given. By necessity, this account has to make use of quite a number of technical terms the meaning of which, however is elucidated by 14 excellent text figures, also by Paul Weatherwax. For further explanation of technical terms the reader also has recourse to a glossary at the end of the book.

In "Grasses of Indiana" 201 species, 19 varieties and 7 forms of grasses are described, for the most part from specimens collected by Mr. Deam within the State. The measurements, which are taken from herbarium specimens, are given in the metric system. For the guidance of those not familiar with the metric system a comparison between it and the English system is given on page 349. In the nomenclature the International code is followed, and when any name used differs from that of Gray's Manual, Edition 7, and Britton and Brown's Illustrated Flora, Edition 2, the names of those works are given as synonyms. The author refrains and, in the reviewer's opinion, quite rightly so, from the extensive use of so-called common or popular names of grasses, on the ground that they are not universal, "frequently misapplied, commonly misunderstood, often fanciful and meaningless, and usually undignified". He advocates the greater use of scientific, latin names, reminding those who object to them that "they are no more unfamiliar and difficult to learn than some meaningless trademark names such as "kodak" and "postum" and that "they are no more difficult than 'carburetor', 'differential', and 'static' ".

For the identification of the various grasses keys to the tribes, genera, and species are provided. These keys which, as the author points out, are entirely artificial, are on the whole simple and easy to work. In a few instances, however, the clearness of the characters separating sections of the keys is somewhat dimmed by the use of such words as "usually", "generally", and the like. This is pointed out, not in a spirit of finding fault, but merely to advise students, in case any doubt should arise as to in what section of a key a plant under examination ought to be placed, to study carefully the very full and comprehensive descriptions of the species prepared by the author, and the numerous, excellent plates* by Paul Weatherwax.

To sum up, the book is a valuable contribution to the knowledge of the flora of Indiana, very creditable to the author and to the Department under whose auspices it has been prepared. And it is more than that. It is an up-to-date treatise on grasses which, as such, should commend itself to botanists all over both the United States and Canada.

The book is attractively made up and neatly bound in strong cloth of a pleasing dark-green colour.—M. O. MALTE.

*A typographical error occurs on page 25, bottom line, where the reader is referred to Plate 71 for illustrations of *Danthonia*. It should read Plate 31. The mistake is somewhat unfortunate as *Danthonia* by a curious coincidence is omitted from the Index.

FIELD BOOK OF NORTH AMERICAN MAMMALS—*Descriptions of every mammal known north of the Rio Grande together with brief accounts of habits, geographical ranges, etc. By H. E. Anthony, M.A., Curator, Dept. of Mammals, American Museum of Natural History. With 32 coloured plates and 175 photographs, pen-and-ink sketches, and maps. G. P. Putnam's Sons, New York-London, The Knickerbocker Press, 1928. 12mo. cloth, xxv, 625, price $5.00.*

This compact little book of 7 x 4½ x 1 inches will prove a boon to all persons interested in the study of mammals, being the only modern handbook which gives description, range, common and scientific name of all the species and subspecies of mammals, 1,445 in all, recognized as inhabiting this territory. The descriptions of our mammals have been scattered in various books and periodicals comparatively inaccessible to most young students, and in many cases too technical for ordinary use. The various popular books, while useful for life histories, are practically useless for the purpose of determining an unknown specimen in hand. The progress in study of mammals has been so rapid and extensive in recent years, and so many new species have been discovered and named, that even the best of the early books fall far short of modern needs.

The size of this book prevents the treatment from being completely monographic, and while it would not be possible positively to identify all specimens by aid of this book, sufficiently clear characters are given for recognition of all the important forms, and for many of the subspecies. References are given where the subjects may be pursued farther if necessary. As few skull characters are given, some forms based on such characters can not be adequately de-

termined. The lack of systematic keys is a defect in many eyes, although the descriptions of families and major groups are as a rule full enough for practical purposes, and the generous use of illustrations and distributional maps will generally enable the user of the book to run down the species. The numerous distributional maps are particularly useful in giving the ranges of the species and subspecies at a glance. As they display few serious inaccuracies, and as most mammals are quite rigidly fixed in their habitats, provisional identification by ranges is much more dependable than it is with birds or other widely migratory animals. It is only fair to state that the few slight inaccuracies in mapping ranges are largely due to lack of publication of known records and detract little from the value of the book as a field manual or key. The description of habits of the groups and species are very characteristic and readable, reflecting the wide field knowledge of the author, and give briefly the most interesting and essential facts. In a word, the chapter introductions and running comments here and there give the general information about mammals which everyone ought to know.

The tones of some of the coloured plates leave much to be desired, and the line drawings while generally aptly illustrative, and in many cases admirably catching the spirit of the subject, would appear more artistic in a larger, wider-margined book on rough paper. The distribution maps, while serving their purpose very well also have a somewhat crude appearance in a small book on thin India paper. The publishers informs us, however, that the plant cost of producing the book was about $7,500 irrespective of the running cost of printing and binding. As a book of this character is necessarily of comparatively limited circulation, minor criticisms on technique are superfluous, and the publishers should be heartily commended and thanked for their courage and enterprise in bringing out such a neat and useful volume at the price asked.

From the standpoint of scientific nomenclature, G. S. Miller's "List of North American Recent Mammals, 1923" has been taken as the basis although some new data involving changes of names have been incorporated. Miller's List was purely technical and gave no English or vernacular names. The reviewer believes with Anthony that common names are a necessity in a book of this type. The selection of suitable names of this character is by no means an easy task, and while we believe that the author has made by all means the best selection of names up to the present time, it is not difficult to raise objections to some of the names given. Where obviously inappropriate names have actually come into common use and are *de facto* in the vernacular there is admittedly nothing that can be done about it, but the reviewer has a deep-seated prejudice against stilted and artificial inventions like the "Cantankerous Meadow Mouse" of Elliot. Is there not some hidden vernacular limbo or synonymy into which we can drop such ridiculous appellations?

In addition to notes on habits, food, etc., the author has given a brief summary of the enemies of each group, but has fallen into a common error in listing "Wolves, Polar Bears, and possibly (when young) Snowy Owls" as enemies of the Arctic Fox. It is well known in the North that the wolf is essentially a big-game hunter, and while an occasional aged or wounded wolf may eat dead foxes found in traps, the healthy fox is far too alert to be caught by a lone wolf and the skimpy carcass of the little white fox is an uneconomical quarry for hunting by wolves in packs. On the contrary, where caribou are common, the foxes follow them and glean much of their winter food from the wolves' abandoned kills. Foxes often live on the sea ice far from land, and habitually follow the polar bear as a parasite which is at least tolerated, living largely upon the remnants and spilled blood of seals killed by the bear. The Snowy Owl doubtless picks up an occasional fox cub, but as the snowy owls, foxes, and lemmings reach their peak of abundance about the same time and the lemming is the principal food of both the others, the owls do not appear to bother the foxes very much. However, as there is a notable movement of arctic foxes as well as owls to the southward following the periodic decline of the lemming population, and as these migrating foxes do not appear to return again to the North and never get a permanent foothold in the South, it may be a case of "dog eat dog" at such times, with the foxes coming out second-best.

A few cases may be mentioned where deviations are made from Miller's 1923 List. The reviewer has for some time held Anthony's idea of making *Ovis stonei* a subspecies of *Ovis dalli*, as every shade of intergradation, including the so-called *Ovis fannini*, is found between the two. *Ovis dalli fannini* seems hardly worthy of retention unless we adopt the principle of naming intergrades, and that logically leads to describing *intergrades between intergrades*. Anthony is undoubtedly right in considering *Ovis canadensis nigra* Millais as a synonym of *Ovis dalli stonei*, but *Ovis canadensis samilkameenensis* is certainly not the same as *stonei*, as it belongs to the heavy, thick-horned group. *Samilkameenensis* may not

be worthy of subspecific recognition, but there is still some doubt whether it belongs with *Ovis canadensis canadensis* Shaw or *Ovis canadensis californiana* (Douglas). We also agree with the author in dropping four of Matschie's species of wolverine, *Gulo auduboni, bairdi, katschemakensis* and *niediecki* being all synonymous with *G. luscus* (Linnaeus). The so-called Southern Wolverine, *Gulo luteus* Elliot, separately largely on grounds of paler colour pattern, is said to range from California to Alaska, but is matched in pale colour by many specimens throughout the range of *luscus*, and if recognizable at all must be purely a geographic race or subspecies of *Gulo luscus*.

A few other supplementary points may well be called to the attention of Canadian mammal students without any spirit of criticism. *Microtus drummondii* (Audubon and Bachman) is now quite widely recognized as a subspecies of *M. pennsylvanicus*.

Three alleged Canadian species of bats have recently been placed in synonymy (Miller and Allen, "American Bats or the genera Myotis and Pizonyx", 1928): *Myotis pernox* Hollister = *Myotis lucifugus alascensis* Miller; *Myotis altifrons* Hollister = *Myotis volans longicrus* Miller; and *Myotis californicus cilialabrum* Merriam = *Myotis subulatus subulatus* (Say). Miller lists the Pacific Raccoon, *Procyon psora pacifica* Merriam but Anthony places it as a subspecies of the Eastern form, *Procyon lotor*. The Black Bears of North America as a whole have not been worked up thoroughly, and although the reviewer agrees with Hall (Univ. California Publ. Zool. 1928) in considering them all subspecies of *Ursus americanus*, the author conservatively retains them under six species of *Euarctos*. On the other hand he has more or less arbitrarily cut down the 84 forms of Grizzly and Big Brown Bears of Merriam (N. A. Fauna, No. 41, 1918) to 18 forms which he retains. The reviewer has no faith in two recognizable subspecies of Musk-oxen occupying substantially the same Canadian range near Hudson Bay and would relegate *Ovibos moschatus niphoecus* Elliot to synonymy. The small amount of white on head and face of some continental specimens probably shows intergradation with *O. m. wardi* Lydekker of the northern islands.

Grinnell and Dixon (1926) place the Queen Charlotte Marten, *Martes nesophila* (Osgood) and their newly described subspecies *vancouverensis* as subspecies of *Martes caurina*. The Labrador Marten, listed as *Martes brumalis* (Bangs) is also almost certainly a subspecies of *Martes americana*.

The Puget Sound Weasel, *Mustela streatori* (Merriam) is apparently a subspecies of *M. cicognanii*. The reviewer is unable to recognize any valid distinctions between the Canada Lynx, *Lynx canadensis canadensis* Kerr and the so-called Arctic Lynx, *L. c. mollipilosus* Stone. The northern lynxes make periodic irruptions in large numbers to the Arctic coast when the varying hares fail in the interior districts, but there is little to show that the lynxes differ (See Annual Report, for 1927, Nat. Mus. of Canada, 1929, pp. 98–99). We are also unable to make any distinctive characters hold between the circumpolar Bearded Seal, *Erignathus barbatus* (Erxleben), and the Pacific form, *E. b. nauticus* (Pallas), the characters specified by Osgood (N. A. Fauna, No. 24, 1904), in reviewing the latter name being evidently based on juvenile characters in a few specimens and these are not at all constant. Ellesmere Island Caribou is hardly a satisfactory name for the polar caribou, as they are also found on the Sverdrup Islands, and apparently intergrade with *Rangifer arcticus*, in which case the form should stand as *Rangifer arcticus pearyi* (Allen).

The Oregon Mole, *Scapanus townsendii* (Bachman) has recently been found to occur in extreme southwestern British Columbia (Ann. Report 1927, Nat. Mus. Canada, p. 20), specimens being taken at Huntingdon, B.C., in 1927. Anthony's distribution map of Prairie-dog does not show this species as reaching the Canadian border, but recent researches and collections made in 1927 and 1929 show that there are several colonies of *Cynomys ludovicianus ludovicianus* (Ord) in southwestern Saskatchewan. This species is also said to have formerly been found in southwestern Alberta, and while the records are not very definite and are perhaps not authentic, they are worth investigating further. The little short-tailed Shrew *Cryptotis parva* has also recently been taken in Ontario. (Cross and Dymond, Mammals of Ontario, 1929, p. 23).

In conclusion the reviewer wishes to state that he has tried out this Field-Book thoroughly in the field and in the laboratory and can conscientiously say that it is a most valuable and reliable text which no working mammalogist in Canada can afford to be without.—R. M. ANDERSON, *National Museum of Canada, Ottawa.*

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SOME DECAPODS FROM THE SOUTH-EASTERN SHORES OF VANCOUVER ISLAND

By JOSEPHINE F. L. HART

DURING the summer months of 1928, a collection was made of some of the shore forms of Decapoda occurring around Victoria. These specimens were examined at the University of British Columbia. Further material was obtained in 1929, in the Nanaimo and Victoria Districts. Practically all were found on the shore at low tide or in less than three feet of water. My thanks are due to Dr. C. McLean Fraser for suggesting the work, helping in identification, and obtaining literature.

At Gonzales Point, on the southwest of Gonzales Hill, Victoria, most of the collections in the early part of the summer of 1928 were made. This part is exposed to heavy tides most of the time and the greater part of the shore is very rocky, dropping sharply off shore, to judge by the proximity of kelp beds. The rocks have large fissures between them and these are partly filled with gravel, so that at low tide there are deep tide pools.

At Brentwood Bay, there is an entirely different type of shore. It is about fifteen miles northeast of Victoria and about the same distance from the mouth of the Saanich Arm, so that it does not get the same effect of wind and tide that the beaches of Victoria and the more exposed part do. There is very little sea-weed, and the beach is of sand mixed with strong-smelling mud.

At Parry Bay, the conditions resemble somewhat those of Gonzales Point and the fauna is quite similar. The Bay is bounded by Albert Head on the east and William Head on the west, and is about ten miles southwest of Victoria.

At Horswell Point, at the head of Departure Bay, there are loose, flat sandstone rocks, in which the water has worn hollows and crevices that form perfect hiding places for numbers of crabs.

Certain species were found under similar conditions in the various localities studied. *Hemigrapsus oregonensis* and *H. nudus*, especially the

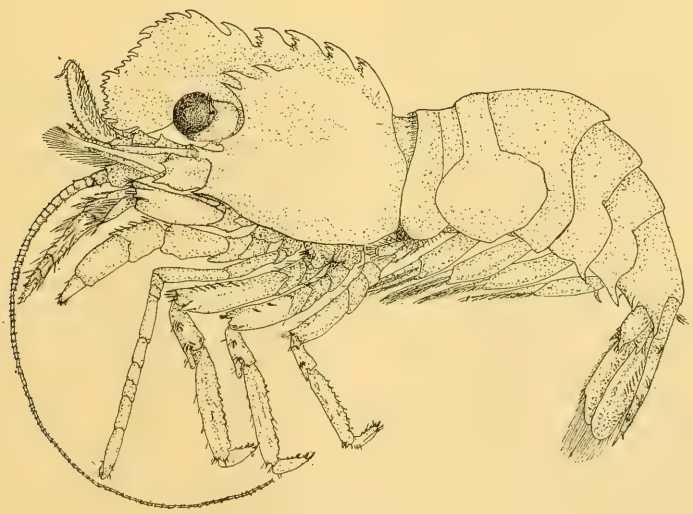

PLATE I

Spirontocaris macrodonta. Male, × 11. Gonzales Point.

latter, were common from high to low tide lines almost everywhere. Hermit crabs, *Pagurus hirsutiusculus*, *P. granosimanus*, and *P. beringanus* were present on all rocky and weeded parts of Gonzales Point and Parry Bay. *Cancer productus*, *C. oregonensis*, and *Lophopanopeus bellus* were found in the sand between loose stones of rocky shores. Sand shrimps, *Upogebia pugettensis*, were in burrows in coarse sand or fine gravel.

The eel grass growing in the tide pools of Gonzales Point, harboured large numbers of *Pugettia gracilis*, and occasionally *P. producta*, and *Oregonia gracilis*. One shrimp, *Spirontocaris macrodonta* was found among the eel grass. On a flat rock, covered with multicolored encrustations and weed, were *Cryptolithodes sitchensis* and *Telmessus cheiragonus*.

At Brentwood Bay, in the sand, *Pinnixa schmitti* was found along with numerous young, and larval stages of the species of crabs inhabiting the locality. Young of *Cancer productus* were common in shallow water as well as under rocks on the beach. Females in berry, and large males, of *Pugettia producta*, were clinging to the piles and sides of the float. Numerous small transparent shrimps of the species, *Spirontocaris paludicola* and *S. moseri*, were found among the fine algal growth on the edge of the wharf.

Immature *Pugettia gracilis* and *P. producta* were found clinging to the various sea-weeds in shallow water at Parry Bay. Under rocks near the low tide mark, *Petrolisthes eriomerus* were very common and the young of the same species were found nearer the high tide line. *Pinnixa schmitti* and *P. tubicola* were commensal in the tubes of sand worms. In the shallow water off shore small shrimps; *Spirontocaris brevirostris*, *S. stylus*, and *S. tridens*, were caught among the *Ulva* and *Laminaria*.

On the west side of the Bay, Witty's Spit affords an ideal spot for *Cancer magister* and the commensal crabs in clams. *Pinnixa littoralis* and *P. faba*, were obtained mainly in the mantle cavity of *Schizothaerus nutallii*, although some small specimens were living inside edible clams.

Adult *Pugettia gracilis* and *P. producta* were found by pulling the ribbons of *Nereocystis* out of the water, from the side of a rowboat. Here also were caught shrimps of the species; *Hippolyte californiensis* and *Spirontocaris stylus*.

The complete list of the species found inhabiting the beaches of the Island is given. One new species is described, new records for distribution are given for *Orthopagurus schmitti* and *Pinnixa tubicola*, and variations in color or form are noted for each species listed. The complete list is as follows:

MACRURA.
- *Hippolyte californiensis* Holmes.
- *Spirontocaris macrodonta* Hart.
- " *tridens* Rathbun.
- " *stylus* (Stimpson).
- " *brevirostris* (Dana).
- " *sitchensis* (Brandt).
- " *moseri* Rathbun.
- " *paludicola* (Holmes).

ANOMURA.
- *Upogebia pugettensis* (Dana).
- *Pagurus granosimanus* (Stimpson).
- " *hirsutiusculus* (Dana).
- " *beringanus* (Benedict).
- *Orthopagurus schmitti* (Stevens).
- *Petrolisthes eriomerus* Stimpson.
- *Cryptolithodes sitchensis* Brandt.

BRACHYURA.
- *Oregonia gracilis* Dana.
- *Pugettia producta* (Randall).
- " *gracilis* Dana.
- *Scyra acutifrons* Dana.
- *Lophopanopeus bellus* (Stimpson).
- *Cancer productus* Randall.
- " *magister* Dana.
- " *oregonensis* Dana.
- *Telmessus cheiragonus* (Tilesins)
- *Pinnixa faba* (Dana).
- " *littoralis* Holmes.
- " *tubicola* Holmes
- " *schmitti* Rathbun.
- *Scleroplax granulata* Rathbun.
- *Hemigrapsus nudus* (Dana).
- " *oregonensis* (Dana).

HIPPOLYTE CALIFORNIENSIS HOLMES

Hippolyte californiensis Holmes, Proc. Calif. Acad. Sci. (2), 4, 576, figs. 21–26, 1895: Schmitt, Univ. Calif. Publ. in Zool. 23, 48, fig. 26, 1921.

Colour. Transparent kelp-brown with pale blue spots on carapace, rostrum, and antennal scale, not entirely green as given by Holmes.

Dimensions. Ovigerous female, 32 mm. in length.

General Distribution. Sitka, Alaska, to San Diego, California (Rathbun).

Local Distribution. Parry Bay, between ribbons of *Nereocystis*.

Remarks. Of two ovigerous females, one has two dorsal teeth on the rostrum, the tip of which appears to bifid, and the other has three teeth placed proximally; neither of which is typical.

SPIRONTOCARIS MACRODONTA
NEW SPECIES
PLATE I.

Allied to *S. prionota* (Stimpson).

Characters. Male. Carapace dorsally crested for nearly its entire length; armed with four teeth,

the anterior margins of which are armed with small spines, (usually four on each tooth). There are three supraorbital spines in a longitudinal row. The rostrum is shorter than the carapace; lamelliform, and very deep, armed above with 15 small curved teeth and below with 7, which decrease in size anteriorly. Eye with 3 small, hair-like spines on inner anterior angle. Antennal peduncle reaching beyond the second segment of the antennular peduncle. Antennular scale reaching to the end of the third segment of the peduncle; the thickened portion of the outer flagellum, very much thickened and reaching beyond the antennal scale. Antennal and pterygostomian spines well developed.

Maxillipeds reaching beyond the antennal scale, and armed with dark, corneous-tipped spines. First pair of legs stout; dactyls armed with two corneous teeth. Dactyli of last three pairs of legs about one third as long as their propodi.

Posterior margin of third abdominal segment produced backward medially; somewhat angled laterally. The fourth and fifth segments have the postero-lateral angles produced in a sharp tooth. Sixth segment slightly longer than fifth, about two-thirds the length of the telson, which is provided with four pairs of lateral spinules.

Female.—The female is similar to the male except that the two anterior dorsal teeth on the carapace are cut dorsally into two small teeth. There are 20 teeth on the upper edge of the rostrum and 6 below. The posterior margin of the third abdominal segment is produced backward medially but is not angled laterally as is the case in the male.

Colour. Male. Sides of carapace finely spotted with red, as well as the rostrum, acicle, maxilliped, chelipeds, basal segments of the legs and the anterior part of the abdomen. There are blue streaks on the posterior mid-dorsal margin of the carapace and the proximal part of the abdomen, on body below the pterygostomian spine, and on the base of the first leg and ischii of the third and fourth legs.

Female. A female from shallow water is similar in colour to the male except that the colours are less intense, but one from ten fathoms has the carapace and the inner pair of uropods a tawny olive, while the rest of the animal is rufous.

Dimensions. A male is 20 mm. and a female is 33 mm. in length.

Local Distribution. A male was found among eel grass in a tide pool at Gonzales Point, June 20th, 1928. At False Narrows, near the water's edge, and also in about ten fathoms in Departure Bay, females were obtained on May 8th and July 22nd, 1929.

Remarks. Differs from *S. prionota* in the rostrum being armed with small, curved teeth, which vary in number from 12 to 20, rather than being minutely serrated above, and by 6 or 7 teeth instead of 4 or 5 below; in the length of the antennal scale and maxillipeds, and in the dactyls being less than one half as long as their propodi. The maxillipeds and the antennal scale reach beyond the rostrum, which differs from the original description of *S. prionota* by Stimpson. There are only two supra-orbital spines in one of the females, but otherwise the specimens are similar.

SPIRONTOCARIS TRIDENS RATHBUN

Spirontocaris tridens Rathbun. Proc. U.S. Nat. Mus., XXIV, 896, 1902. Rathbun, Harriman Alaska Expedition, 10, 81, fig. 34, 1904.

Colour. Body transparent, with very fine blue and red spots arranged so as to give a striped appearance, and the maxillipeds are red. Antennal flagella banded with red.

Dimensions. About one half the type length of 61 mm. (Rathbun).

General Distribution. From the Aleutian Islands to Washington, to a depth of 48 fathoms.

Local Distribution. Parry Bay, among *Laminaria*, in shallow water.

Remarks. One specimen has 7 spines on lower limb of rostrum.

SPIRONTOCARIS STYLUS (STIMPSON)

Hippolyte stylus Stimpson, Proc. Acad. Nat. Sci. Phila. XVI, 154, 1864.

Spirontocaris stylus Rathbun, Harriman Alaska Exped. 10, 84, fig. 36, 1904.

Colour. Transparent, with a kelp-brown tinge and varying amounts of fine red spotting.

Dimensions. Slightly shorter than length of 44.5 mm. as given by Rathbun.

General Distribution. Barclay Sound and Sucia Island, St. of Georgia.

Local Distribution. Parry Bay, low tide among *Laminaria* and *Ulva* and at the surface among ribbons of *Nereocystis*.

Remarks. Two of the specimens have 7 spines on the lower limb of the rostrum.

SPIRONTOCARIS BREVIROSTRIS (DANA)

Hippolyte brevirostris Dana, Proc. Acad. Nat. Sci. Phila. 6, 24, 1852.

Spirontocaris brevirostris Schmitt, Univ. Calif. Publ. in Zool., 23, 66, 1921.

Colour. Semi-transparent, with a kelp-brown tinge. Blue stripes on dactyls and propodi, and in some, on the legs and part of carapace.

Dimensions. Of type length (31.8 to 38 mm.).

General Distribution. Attu, Aleutian Islands, to San Francisco Bay, California (Rathbun). Low water to 25 fathoms.
Local Distribution. Common at low tide among *Laminaria* and *Ulva* in Parry Bay.
Remarks. Of 51 specimens, some immature, none had 6 teeth on rostrum, 5 had 5, 38 had 4, 6 had 3, and 2 had 2 teeth. Specimens taken at low tide among *Eudistylia* tubes at Brockton Point, Vancouver, March 17th, 1929, were strikingly different in colour from those obtained in August, 1928: an ovigerous female had the main part of carapace an opaque pinkish white, striped grey and blue legs, and a brilliant green abdomen, another was deep brown, marked with blue, and the rest were more transparent, spotted with deep brown and all had blue tipped walking legs. One was parasitized by *Bopyroides* sp.

SPIRONTOCARIS SITCHENSIS (BRANDT)

Hippolyte sitchensis Brandt, Middendorff's Reise Sibir., II, Zool. Theil. I, 116, pl. V, fig. 18, 1851.

Spirontocaris sitchensis Rathbun, Harriman Alaska Exped. 10, 102, 1904.

Colour. Carapace and abdomen faintly striped with bands of fine red and blue spots, on semi-transparent kelp-brown. Pereiopods, pleopods, and telson blue striped.
Dimensions. Female, 32 mm. in length.
General Distribution. From Sitka, Alaska, southward to Puget Sound.
Local Distribution. Ross Bay, tide pool, among broken barnacle shells.

SPIRONTOCARIS MOSERI RATHBUN

Spirontocaris gaimardii Rathbun, The Fur Seals and Fur-Seal Islands of the North Pacific Ocean, Pt. III, 556, 1899 (part).

Spirontocaris moseri Rathbun, Harriman Alaska Exped. 10, 91, fig. 39, 1904.

Colour. Very transparent, diagonally striped with blue on carapace, pereiopods, and pleopods. In some there are fine red dots on the blue stripes.
Dimensions. Specimens about one fourth the length given by Rathbun (57 mm.).
General Distribution. Bering Sea southward and eastward to Washington, 60 fathoms to 516.
Local Distribution. Brentwood Bay, among algae growing on edge of float.
Remarks. Rostrum with 6 or 7 teeth above and 3 or 4 below. Sixth abdominal segment less than twice as long as fifth and seventh with 4 to 6 pairs of lateral spinules. These variations as well as the occurrence in shallow water are probably due to the specimens being immature.

SPIRONTOCARIS PALUDICOLA (HOLMES)

Heptacarpus paludicola Holmes, Occas. Papers Calif. Acad. Sci., 7, 201, pl. 3, fig. 56, 57, 1900.

Spirontocaris paludicola, Schmitt, Univ. of Calif. Publ. in Zool., 23, 64, fig. 42, 1921.

Colour. Not uniform green (Holmes), but transparent and carapace diagonally striped with fine red spots. Legs banded with pale blue.
Dimensions. About one half length as recorded by Schmitt, (22 mm. to 32 mm.).
General Distribution. British Columbia to San Diego, California.
Local Distribution. Brentwood Bay, among algae on edge of float.
Remarks. Telson shorter than antennal scale or about the same length, probably due to the specimens being immature.

UPOGEBIA PUGETTENSIS (DANA)

Gebia pugettensis Dana, Proc. Acad. Nat. Sci. Phila., 6, 19, 1852.

Upogebia pugettensis, Stevens, Publ. Puget Sd. Biol. Sta., 6, 318, fig. 1–5, 1928.

Colour. Similar to Stevens' description.
Dimensions. Total length 65 mm. and carapace 20 mm. Type length, 50.8 mm.
General Distribution. From south-eastern Alaska to San Quentin Bay, Lower California (Rathbun).
Local Distribution. In burrows, in rather muddy sand at Parry Bay and Gonzales Point.

PAGURUS GRANOSIMANUS (STIMPSON)

Eupagurus granosimanus Stimpson, Ann. Lyc. Nat. Hist. N.Y., 7, 90, 1859.

Pagurus granosimanus, Stevens, Publ. Puget Sd. Biol. Sta., 3, 68, 282, 1925.

Colour. Similar to Stevens' description.
Dimensions. Carapace 12 mm. in length.
General Distribution. Unalaska to Escanada, Lower California. Beach to 15 fathoms.
Local Distribution. Common at low tide at Gonzales Point and Parry Bay.
Remarks. The coloration does not agree with Rathbun's description but this is probably because she described them from preserved specimens. Two specimens from Parry Bay occupied the same shell, the smaller one showing through a broken part of the shell.

PAGURUS HIRSUTIUSCULUS (DANA)

Bernhardus hirsutiusculus Dana, Proc. Acad. Nat. Sci. Phila., 5, 70, 1851.

Pagurus hirsutiusculus, Stevens, Publ. Puget Sd. Biol. Sta., 3, 68, 281, 1925.

Colour. Similar to Stevens' description.

Dimensions. Less than type length of carapace (31.8 mm.).
General Distribution. St. Paul Island, Pribilofs (T. Kincaid); Siberia, Kamchatka (Rathbun); Aleutian Islands to San Diego, California (Schmitt); Japan, (Stimpson). Low tide to 17 fathoms (Schmitt).
Local Distribution. The commonest species at low tide at Parry Bay and Gonzales Point.
Remarks. A large number parasitized by *Pseudione giardi* Calman; usually in the right branchial cavity, less frequently in the left, and occasionally in both sides.

PAGURUS BERINGANUS (BENEDICT)

Eupagurus beringanus Benedict, Proc. U.S. Nat. Mus., 15, 17, 1892.
Pagurus beringanus, Stevens, Publ. Puget Sd. Biol. St., 3, 68, 283, 1925.

Colour. Similar to Stevens' description except that distal end of merus with flame colored band rather than the same colour as the tips of the fingers.
Dimensions. Slightly smaller than the type length of carapace (21 mm.).
General Distribution. Bering Sea (latitude of Nunivak) southward, along the Aleutian Islands and Coast of Alaska to Monterey, California; 5 to 19 fathoms (Rathbun). Rather common on most rocky shores at low tide and in tide pools (Stevens).
Local Distribution. Shallow water, at Parry Bay and Gonzales Point.
Remarks. Dactyls slightly longer than propodi.

ORTHOPAGURUS SCHMITTI (STEVENS)

Phylopagurus schmitti Stevens, Publ. Puget Sd. Biol. Sta., 3, 297, fig. 19–22, 1925.
Orthopagurus schmitti Stevens, Publ. Puget Sd. Biol. Sta., 5, 249, 1927.

Colour. Similar to Stevens' description.
Dimensions. Somewhat smaller than the type length of 34 mm.
General Distribution. Vicinity of Friday Harbour, Wash. (From previous records).
Local Distribution. Horswell Point, common in the tubes of *Serpulids* exposed by minus tides.

PETROLISTHES ERIOMERUS STIMPSON

Petrolisthes eriomerus Stimpson, Ann. Lyc. Nat. Hist. N.Y., 10, 119, 1871. Schmitt, Univ. Calif. Publ. in Zool. 23, 180, fig. 114, pl. 32, 1921.

Colour. Reddish brown mottled with varying amounts of blue. A soft-shelled specimen is almost entirely blue. All have at least part of outer maxilliped and proximal internal angle of dactylus of cheliped a bright porcelain blue.
Dimensions. Carapace 13 mm. long and 14 mm. wide. Schmitt reports largest carapace as 10 mm. long and 10.5 mm. wide.
General Distribution. From British Columbia to Lower California.
Local Distribution. Underneath rocks at low tide at Ross Bay, Gonzales Point, Parry Bay and Horswell Point.

CRYPTOLITHODES SITCHENSIS BRANDT

Cryptolithodes sitchensis Brandt, Bull. Phys-Math. Acad. Imp. Sci. St. Petersb., 11, 254, 1853. Schmitt, Univ. Calif. Publ. in Zool. 23, 155, fig. 100, pl. 20, fig. 3 and 4.

Colour. Male. Carapace white, dorsally finely pencilled with fine red lines, emphasizing aerolations and margins; two white commas on lateral margin of gastric region; ventrally speckled in an irregular brown ribbon parallel to margin. Distally pereiopods are red-brown. Red spot on anterior lateral part of ischium of first three pairs of walking legs and pleuron of abdomen also spotted. Dactylus of first three pairs of walking legs black. Dorsal side of blade of antennal scale marked like the carapace and the flagella banded with brown.

Female. Markings similar except pencilled in pale grey-green, a chocolate brown streak on the median line and irregular blotches of the same colour and red-brown scattered over the rest of the carapace. Markings on ventral margin paler than in male.
Dimensions. Male, 37 mm. long and 57 mm. wide and the female 50 mm. long and 70 mm. wide.
General Distribution. From Sitka, Alaska, to Pacific Grove, California.
Local Distribution. Among eel grass at Gonzales Point.
Remarks. Female large and of unusual color as compared to Holmes' record, but compared with specimens from Queen Charlotte Is. is usual size. Difference of shape between male and female; male about $1\frac{2}{3}$ as wide as long and female $1\frac{1}{3}$.

OREGONIA GRACILIS DANA

Oregonia gracilis Dana, Amer. Journ. Sci. ser. 2, 11, 270, 1851. Rathbun, U.S. Nat. Mus., 129, 71, fig. 19–20, pl. 24–25, 1925.

Colour. Tan with red chelae.
Dimensions. About two thirds the type length of 65.7 mm.
General Distribution. Bering Sea to Monterey, California. Shallow water to 212 fathoms.
Local Distribution. Among eel grass at Gonzales Point.

PUGETTIA PRODUCTA (RANDALL)

Epialtus productus Randall, Journ. Acad. Nat. Sci. Phila., 8, 110, 1839.

Pugettia producta Rathbun, U.S. Nat. Mus., 129, 167, pl. 56–57, 1925.

Colour. Similar to Weymouth's description.
Dimensions. Somewhat smaller than the large male described by Weymouth.
General Distribution. Vancouver Island, B.C., to Rosalia Bay, Lower California (Balss). Common to at least 40 fathoms (Way).
Local Distribution. Gonzales Point, Brentwood Bay and Parry Bay.
Remarks. Several specimens were tan that were not especially young or recently moulted, as they had well developed barnacles on the carapace, which point differs from Weymouth's observations. Among a number of *P. producta* none were parasitized with *Sacculina*, as Weymouth found the case, although in the same locality *Lophopanopeus bellus* was badly infected.

PUGETTIA GRACILIS DANA

Pugettia gracilis Dana, Amer. Journ. Sci., ser. 2, 11, 268, 1851. Rathbun, U.S. Nat. Mus., 129, 172, pl. 58, fig. 64–65, 1925.

Colour. "Dorsal surface usually greenish brown, ventral side much lighter; but specimens found among red algae are a brilliant red." (Way).
Dimensions. The type size of 53 mm.
General Distribution. From the Western extremity of the Aleutian Islands eastward and southward to Mendocino, California. Shore to 40 fathoms.
Local Distribution. Gonzales Point, among eel grass and *Ulva*, and at Parry Bay among Kelp ribbons.
Remarks. Red specimens were found when not near red algae. Most have last segment of abdomen white and in young specimens, the chelipeds and various parts of sternum are white. In some cases the flagellum of the antenna reaches beyond the rostrum.

SCYRA ACUTIFRONS DANA

Scyra acutifrons Dana, Amer. Journ. Sci., ser. 2, 11, 269, 1851. Rathbun, U.S. Nat. Mus., 129, 195, pl. 224, fig. 4–5, 1925.

Colour. Dark red carapace, with lighter coloured bands on legs. Chelipeds bright red.
Dimensions. Slightly smaller than type length of 52.6 mm.
General Distribution. Kodiak, Alaska, to San Diego, California. Low tide to 45 fathoms.
Local Distribution. Shallow water on rock at Parry Bay.

LOPHOPANOPEUS BELLUS (STIMPSON)

Xantho bella Stimpson, Ann. Lyc. Nat. Hist. N.Y., 7, 204, pl. 5, 1860 (1862).

Lophopanopeus bellus, Schmitt, Univ. Calif. Publ. in Zool. 23, 241, 1921.

Colour. Dorsal surface usually purplish red with varying amounts of dirty white, so that in a few cases the carapace may be entirely white. Ventrally fawn and grey; on the inner surface of the ischium of the outer maxilliped there is a deep red spot.
Dimensions. Male is 19 mm. long and 26 mm wide.
General Distribution. Prince William Sound; Kasaan Bay, Prince of Wales Island, Alaska (Rathbun). Vancouver Island, British Columbia to Monterey Bay, California (Holmes). Lower California (A. Milne Edwards).
Local Distribution. Brentwood Bay, Gonzales Point and Parry Bay.
Remarks. Variation in the number of tubercles on antero-internal angle of carpus of cheliped; from one well defined tubercle, one large and one small, to two well developed ones. There is also a graduation in the sharpness of the teeth on the carapace. Badly parasitized by a *Sacculina*, the only species found so infected during the summers of 1928 and 1929.

CANCER PRODUCTUS RANDALL

Cancer productus Randall, Journ. Acad. Nat. Sci. Phila., 8, 116, 1839. Schmitt, Univ. Calif. Publ. in Zool., 23, 220, fig. 136, 1921.

Colour. Similar to Weymouth's description.
Dimensions. A dried carapace is 85 mm. long and 140 mm. wide. Weymouth gives the dimensions of 103 mm. by 173.5 mm.
General Distribution. From Kadiak, Alaska, to Magdalena Bay, Lower California.
Local Distribution. In shallow water and under rocks at Brentwood Bay, Gonzales Point, Oak Bay and Parry Bay.

CANCER MAGISTER DANA

Cancer magister Dana, Proc. Acad. Nat. Sci. Phila., 6, 73, 1852. Schmitt, Univ. of Calif. Publ. in Zool., 23, 229, fig. 138, 1921.

Colour. Similar to description by Stimpson.
Dimensions. A specimen in the Provincial Museum, caught at Victoria, is considerably larger than the measurements given by Schmitt, the carapace being 117 mm. long and 195 mm. wide.
General Distribution. Unalaska to Magdalena Bay, Lower California. Low water to 50 fathoms.
Local Distribution. Sandy beach at Parry Bay.

CANCER OREGONENSIS (DANA

Trichocera oregonensis Dana, Proc. Acad. Nat. Sci. Phila., VI, 86, 1852.

Cancer oregonensis, Schmitt, Univ. Calif. Pub. in Zoöl. 23, 234, pl. 36, 1921.

Colour. Dark red dorsally, light-coloured below. In young specimens there is often great variation in white markings; i.e. cardiac region white, or gastric and hepatic region white, and the rest of the carapace red or the whole carapace and chelipeds may be mottled red and white.

Dimensions. Slightly larger than the type size of 18 mm. by 23 mm.

General Distribution. Aleutian Islands to Lower California (Holmes). Low water to 238 fathoms.

Local Distribution. Common at Gonzales Point, Oak Bay, and Parry Bay.

Remarks. The dorsal surface of the carapace is granulated on the prominent lobes in the larger specimens, but almost smooth in the young. (Spence Bate). Chelipeds of male larger in proportion to carapace than those of female: male and female with length of carapace 21 mm. have respectively chelipeds 9 mm. and 8 mm. in depth, while another male of the same sized carapace has its chelipeds 11 mm. There is considerable variation in the sharpness of the marginal teeth.

TELMESSUS CHEIRAGONUS (TILESIUS)

Cancer cheiragonus Tilesius, Mem. Acad. Imper. Sci. St. Petersb., V, 347, pl. VII, fig. 1, 1815.

Telmessus cheiragonus, Schmitt, Univ. Calif. Publ. in Zool. 23, 235, 1921.

Colour. Similar to Way's description.

Dimensions. A dried carapace is 52 mm. long and 65 mm. wide, which is slightly larger than Holmes' measurements. A specimen in the Provincial Museum is 68 mm. by 85 mm.

General Distribution. Northeastern Siberia; Kamchatka; Kurile Islands; Bering Sea to California (Holmes). Low water to 20 fathoms (Rathbun).

Local Distribution. In shallow water at Gonzales Point and Parry Bay.

PINNIXA FABA (DANA)

Pinnothera faba Dana, Proc. Acad. Nat. Sci. Phila., 5, 253, 1851.

Pinnixa faba Rathbun, Bull. U.S. Nat. Mus., 97, 142, fig. 87–88, pl. 31, fig. 1–4, 1918.

Colour. Tan, with varying amounts of white, some being almost entirely tan or entirely white.

Dimensions. Male, larger than measurements given by Rathbun, is 8.5 mm. long, and 15 mm. wide, while the female is about 1 mm. smaller than hers, which is 15.2 mm. long and 22.8 mm. wide.

General Distribution. From Prince of Wales Islands, Alaska, to Humboldt Bay, California (Rathbun), San Pedro, California (Holmes).

Local Distribution. In mantle cavity of *Schizothaerus nutalli* in the sand flats at Parry Bay.

Remarks. A large number of Polyzoa were attached to the carapace and legs of two of the females.

PINNIXA LITTORALIS HOLMES

Pinnixa littoralis Holmes, Proc. Calif. Acad. Sci., ser. 2, 4, 571, pl. 20, fig. 14–16, 1894. Rathbun, Bull. U.S. Nat. Mus., 97, 145, fig. 89–90 pl. 31, fig. 5–8, 1918.

Colour. Males are white with rufous bands on the first three ambulatory legs and immature females have similar colouring. The mature females, in formalin, usually have large patches of coral red on carapace and in median line of abdomen, while one is tan and white like *P. faba.*

Dimensions. A male, with carapace 8 mm. by 16 mm., is slightly larger than Rathbun's record, but the females are smaller than hers.

General Distribution. From Sitka, Alaska, to San Diego, California. Commensal in clams.

Remarks. "Can be told from *P. faba* by the constantly differing color". (Rathbun). This was found to be the case only in males and immature females.

PINNIXA TUBICOLA HOLMES

Pinnixa tubicola Holmes, Proc. Calif. Acad. Sci., ser. 2, 4, 569, pl. 20, fig. 17–18, 1894. Rathbun, Bull. U.S. Nat. Mus., 97, 165, fig. 103, pl. 36, fig. 5–8, 1921.

Colour. Tan and gray mottled.

Dimensions. Larger than Rathbun's specimens: male, carapace, 4.5 mm. long and 9 mm. wide; female 5 mm. long and 13 mm. wide.

General Distribution. Puget Sound to San Diego, California. (From previous records). Commensal in leathery tubes of annelids (Holmes).

Local Distribution. Parry Bay, Horswell Point, and Shelter Point, (near the mouth of Campbell River), at low tide under rocks in the sand tubes of Amphritite worms.

PINNIXA SCHMITTI RATHBUN

Pinnixa occidentalis Rathbun, Harriman Alaska Exped. 10, 187, 1904. (specimens from Cape Fox).

Pinnixa schmitti Rathbun, Bull. U.S. Nat. Mus., 97, 162, fig. 101, pl. 35, fig. 6–7 and 9, 1918.

Colour. Carapace and legs grayish white. In some there are tan markings on the carapace.

Dimensions. Smaller than type as given by Rathbun.
General Distribution. Port Levasheff, Alaska, to San Francisco Bay, California. 7 to 80 fathoms (Rathbun).
Local Distribution. In muddy sand at Brentwood Bay and in tubes of Amphritite worms, under rocks at Parry Bay, with *P. tubicola.*
Remarks. Chela of some males are granulate with comparatively long thumbs, others non-granulate with shorter thumbs. Unusual to find teeth of fingers of male as smooth as in figure by Rathbun; often serrate margin proximal to the median tooth of thumb. Some have two large teeth on thumb and the tips of fingers are slightly hooked as in females.

SCLEROPLAX GRANULATA RATHBUN

Scleroplax granulata Rathbun, Proc. U.S. Nat. Mus., XVI, 251, 1893. Wells, Publ. Puget Sd. Biol. Sta., 6, 304, fig. 42–47, 1928.
Colour. Carapace ivory white with tan markings and the merus of the walking legs is rufous.
Dimensions. Male: length of carapace 5 mm., width 8 mm., which is larger than the type specimen.
General Distribution. Departure Bay, B.C., to Ensenada, Lower California.
Local Distribution. In burrows of *Upogebia pugettensis,* at Gonzales Point.

HEMIGRAPSUS NUDUS (DANA)

Cyclograpsus marmoratus White, (not *Cancer marmoratus* Fabricius). List Crust. Brit. Mus., 41, nomen nudum, 1847.
Hemigrapsus nudus Rathbun, Bull. U.S. Nat. Mus., 97, 267, pl. 69, 1918.
Colour. Similar to Holmes' description.
Dimensions. Male, slightly smaller than one described by Rathbun, which has carapace 40 mm. long and 56.2 mm. wide. Female, length of carapace 27 mm. and width 30 mm.
General Distribution. From Sitka, Alaska, to Gulf of California (Rathbun).
Local Distribution. Gonzales Point, Brentwood Bay and Parry Bay.
Remarks. A freshly moulted specimen (carapace 30 mm. long), was yellowish with very few red spots on chelipeds. Two others of about the same size were brick-red, and were living among eel grass.

HEMIGRAPSUS OREGONENSIS (DANA)

Psuedograpsus oregonensis Dana, Proc. Acad. Nat. Sci. Phila., 5, 248, 1851.
Hemigrapsus oregonensis, Rathbun, Bull. U.S. Nat. Mus., 97, 270, pl. 40, 1918.
Colour. Dorsally dull gray mottled with dark red spots, the chelipeds usually yellowish, and ventrally whitish. Variation in young, often all white.
Dimensions. Smaller than measurements given by Rathbun.
General Distribution. From Prince William Sound, Alaska, to Gulf of California, Mexico.
Local Distribution. Gonzales Point, Brentwood Bay and Parry Bay.
Remarks. Smallest ovigerous female found measured 7 mm. long and 9 mm. wide.

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Nov. 5, 1929.

NOTES ON BIRDS OF THE LABRADOR PENINSULA IN 1929

By HARRISON F. LEWIS

DURING 1929 I was engaged in bird protection activities on the south shore of the Labrador Peninsula, in Saguenay County, Quebec, from June 7 to September 14. The following notes, with the exception of one concerning the Lapwing, relate to observations made during that period.

1. *Colymbus auritus.* HORNED GREBE.—A specimen of this species came into my possession in July, at Whale Head, about fifteen miles east of Harrington Harbour. I was told that it had been shot at Whale Head, in October, 1928, by Mr. Albert Mauger, a resident of that place. Neither Mr. Mauger nor other hunters of Whale Head who saw this bird could remember having seen another like it at any time. Presumably this record indicates the approximate periphery of the range of the species in this part of North America. The specimen has been presented to the National Museum of Canada.

2. *Phalacrocorax carbo.* COMMON CORMORANT.—The colony of this species on the cliffs of Lake Island, near Cape Whittle, was observed to contain at least 49 occupied nests on June 28, 1929, which may be compared with 48 occupied nests found here on June 13, 1928 (*Can. Field-Nat.*, 42: 192). Many young were reared successfully in this colony in 1929.

3. *Mergus serrator.* RED-BREASTED MERGANSER.—An adult female, accompanied by five young unable to fly, was seen in the eastern cove of Wapitagun Island on August 16.

4. *Somateria mollissima dresseri.* AMERICAN EIDER.—This species prospered along the south shore of the Labrador Peninsula in 1929. The hatch of young Eiders was a large one, and it seemed to me that a much larger percentage of the young than usual escaped the manifold dangers of infancy and attained full size and the ability to fly.

5. *Branta canadensis canadensis.* CANADA GOOSE.—In the course of a walk, on July 22, from the head of Bradore Bay to the summit of Mt. Cartier and back, I saw two pairs of Canada Geese with their young. One pair was on a rather large pond, about four and one-half miles northeast from the head of the bay; the other pair was on a very small pond, about two hundred feet by fifty feet, situated about five miles northeast of the head of the bay. A small amount of snow and ice still remained unmelted on the low bank of the latter pond. There were four young in the family on the large pond and two young in the other family. In both cases the young were small and downy and were estimated to be about ten days old.

The above statements are published as a definite record, but not as an exceptional one, for, according to information furnished by many credible residents of this coast, Canada Geese in similar numbers, at similar distances from the shore and thence inland, may be found breeding near a large part of the southern coast of the Labrador Peninsula.

6. *Pisobia fuscicollis.* WHITE-RUMPED SANDPIPER.—First observed on fall migration on August 5, when a flock of five was seen at St. Mary Islands Bird Sanctuary. The only later observations of this species were those of a flock of 10 at the same place on August 7, and of a flock of 5 at the Boat Islands, about three miles south-west of St. Mary Islands, on August 18.

7. *Vanellus vanellus.* LAPWING.—From information obtained from several local residents in 1929, it is evident that the invasion of Lapwings in the Newfoundland-Gulf of St. Lawrence region in December, 1927, reached at least as far west as Harrington Harbour, Saguenay County, Quebec (long. 59° 28′ W.), where at least one individual was killed, and apparently one or two others were seen.

8. *Arenaria interpres morinella.* RUDDY TURNSTONE.—First observed on southward migration on July 31, when one individual was seen at St. Mary Islands Bird Sanctuary. Observed frequently in small numbers, as usual, throughout August. During the period from September 5 to September 13, which I spent at Havre St. Pierre, this species was common there and was the most numerous shore bird in the vicinity.

The maximum number recorded in one day was 100 on September 6.

9. *Archibuteo lagopus sancti-johannis.* ROUGH-LEGGED HAWK.—This species was moderately common and nesting from Wolf Bay eastward, its abundance bearing presumably a direct relation to that of the meadow mice (*Microtus pennsylvanicus* subsp. ?) of the region, which were likewise fairly common in the summer of 1929.

On the island called The Black Land, in Wolf Bay Bird Sanctuary, I saw, on August 9, five Hawks of this species, of which four were adults and one was a young bird apparently not long out of the nest. This island is a nesting-ground for thousands of Puffins and Razor-billed Auks, as well as some other sea-birds. On an accessible ledge of a low cliff, about fifteen feet high, close beside one of the principal concentrations of nesting Auks and Puffins, which here live among large boulders, I discovered a recently-vacated nest which had apparently been used by the Rough-legged Hawks. In its vicinity I found nine skeletons of Puffins, with the wings attached to the skeletons. One was on the edge of the Hawks' nest. All of them appeared to have been stripped of flesh within a month prior to the time of their discovery. Three small pellets of mouse fur and bones were also found near the nest.

The Rough-legged Hawk enjoys an enviable reputation as a mouse-killing Hawk and as one that practically never touches a bird. I should be sorry to see its reputation damaged, but the evidence recorded above is sufficient to make it appear probable that the individual Rough-legged Hawks that nested at this place were unable wholly to withstand the temptation afforded by large numbers of birds of rather poor powers of flight gathered immediately beneath their nest. The evidence is offered for what it is worth, as it is circumstantial only, and not entirely conclusive. No Rough-legged Hawks were actually seen catching, killing, or eating Puffins, and it is possible that the birds whose skeletons were found had been killed by Duck Hawks (*Falco peregrinus anatum*), which are known to nest frequently at Wolf Bay.

10. *Colaptes auratus borealis.* BOREAL FLICKER.—One was observed near Natashquan on August 13. This is the easternmost point at which I have seen this species at the coast, although it is known that farther east migrating individuals cross the treeless coastal area, presumably en route to wooded areas farther inland.

11. *Otocoris alpestris alpestris.* HORNED LARK.—At Havre St. Pierre*, where this species is not known to nest, migrating individuals were first seen in autumn on September 12, when a flock of 20 was observed.

12. *Perisoreus canadensis* subsp. CANADA JAY.—There was unusual activity among birds of this species along the south coast of the Labrador Peninsula in August and September, 1929. In most years not many Canada Jays are observed near this coast in spring and summer, although a few are seen at long intervals. I have, however, recorded a distinct movement, accompanied by flocking, that took place here in late August, 1925 (*The Auk*, 44 : 65).

On August 15, 1929, three individuals of this species were observed about the houses at Wolf Bay settlement. Thereafter the species was observed on August 16–17–18–19–23–24–30 and September 1–4–5–6–7–8–9–10–11–12. On September 13 I embarked on a steamer to leave this coast. The Canada Jays were seen chiefly about settlements or on the islands that fringe the coast and that are generally bare or nearly bare of trees. Usually only one or two birds were seen at once, but there were exceptions to this. For example, at Pointe au Maurier on August 19 at least thirteen Canada Jays were flitting about the one house to be found there and at Havre St. Pierre on September 6 fourteen were counted in the village. Observations of this species were made as far east as St. Augustine (August 23) and as far west as Mingan (September 5). These were the extreme limits of my travels between August 15, when the species was observed at Wolf Bay, and September 13, when I took ship to leave the coast, so probably similar conditions existed beyond the places mentioned. Indeed, there is evidence from other sources that this movement of Canada Jays extended far beyond the Labrador Peninsula, and information concerning it is now being gathered, with a view to preparing a separate paper on the subject.

13. *Spizella monticola monticola.* TREE SPARROW.—When, on July 22, in company with Mr. E. C. Abbe, I walked from the head of Bradore Bay to the summit of Mt. Cartier and back, I observed five scattered Tree Sparrows in song. Mt. Cartier is situated somewhat east of north from the head of Bradore Bay. We found our way to and from it by different routes and estimated that we walked sixteen miles in the entire trip. These figures will give some indica-

*Previously known as Eskimo Point.

tion of the degree of abundance of the Tree Sparrow in that region. West of Bradore Bay I have not observed it at all in the nesting season, although Dr. Charles W. Townsend has recorded, it at Old Romaine on July 9, 1915 (*The Auk*, 34 : 139).

14. *Mniotilta varia.* BLACK AND WHITE WARBLER.—One was observed on June 20, at Mascanin (long. 62° 26′W.). This, as far as I know, is the easternmost record for this species on this coast.

15. *Anthus rubescens.* AMERICAN PIPIT.—At Havre St. Pierre, where this species is not known to nest, migrating individuals were first seen in autumn on September 8, when no less than 35 were observed.

16. *Certhia familiaris americana.* BROWN CREEPER.—One was observed at Havre St. Pierre on September 8.

17. *Sitta canadensis.* RED-BREASTED NUTHATCH.—In 1929 this species was observed more often than has been usual in this region in the past. At St. Mary Islands two were seen together on July 31, one was seen on August 1, and one on August 3. Five were observed in trees on the mainland at Natashquan on August 13. One was observed on the Boat Islands on August 18, one on the mainland at La Tabatière on August 23, and one on the mainland at Betchewun on September 3.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

PHYSIOLOGICAL CONDITIONS

(*Continued from page 87*)

SCIENTIFIC investigations in this field were impossible, and also hardly necessary as the conditions in the Treeless Plains do not vary to any marked degree from the rest of central Canada. The average winter temperature is doubtlessly lower, but not low enough where we were to effect organically the average human being.

A few notes nevertheless may be of interest.

All the members of our party had lived for a number of years in northern Canada except myself, and apart from the fact that, excluding Hornby, I knew little of them, I did not see them often enough to study any changes that might have taken place.

That the land of the caribou is healthy in the extreme, there is no doubting. A great deal of fresh meat is eaten, and unlimited exercise is the order of almost every day. There were only two instances of indisposition amongst eight of us during an entire year.

The first was the case of the youngest member of the party, an extremely powerful man of the age of about twenty-six, who whilst standing over six feet weighed little less than two hundred pounds, an American by birth who had resided most of his life in the Peace River district. This man suffered from intestinal trouble in the form of three regular evacuations a day. This appeared normal with him, and it seems that it had been going on for a number of years, and a cursory inspection of the motion showed no abnormal conditions. During the heavy work over the portages, when he did more than his full share of work, I was surprised to notice that no weakness seemed incurred, especially as he was a small eater. It may be mentioned that he was, whilst with us, a total abstainer. Like many of his class he was somewhat averse to adopting a straight or almost straight meat diet, being very fond of the foods to which apparently he had been used at home, flour, pork, butter, milk, beans, etc.

As the weather became colder, and the discomforts of yielding to nature became more noticeable, because it was found impossible to erect any form of shelter, it was but natural that this peculiarity caused him to try and effect a change in his habits.

During November a short trip with dogs was made, when as might be expected, a further effort at control was attempted. At the conclusion of the trip a day or two of rest was indulged in followed by intense abdominable pains that confined him to bed for four days, and for a while complications in the form of an appendicitis were feared. The trouble, however, gradually passed, and he was persuaded eventually to live more on fresh meat. For a while no change was noticed as regards the frequency of evacuation, but as is invariably the case, the liking for fresh meat grew until a preference was shown for this form of diet. With preference a distinct change however came, and a return to normality ensued, a condition which in my opinion gave him both

an added resistance to the cold, and increased energy.

One member of the party was seventy years old, and although he told me that in recent years he has suffered variously, I know that at the end of his sojourn on Artillery Lake his health and spirits were all that could be desired. This man however lived quite comfortably throughout the winter in the timber, neither overworking nor suffering from any lack of staple provisions.

The second case of sickness was in the instance of Hornby. Although I had noticed no weakening on his part it occurred that after a rather arduous trip in mid-winter during which the most adverse weather conditions were experienced, he returned one evening and collapsed. Violent vomitting ensued with acute pains in the stomach. For three days I experienced no little anxiety, having no medical comforts with which to render treatment. He gradually recovered, though I am of the opinion that a return to normal was not made for some weeks afterwards.

It would appear that the older the man the greater the stamina, in most instances, up to the age of about fifty-five. This, however, must be explained. Take two men of the same physical and mental characteristics, but one of 26 years, and the other of 50 years of age. Although twenty-six is the age when athletes are often at the top of their form their prowess as athletes is not in accordance with the performance put up by them when out day after day under exacting conditions. Although the world's champion boxer at the age of twenty-six would undoubtedly despatch the former world's champion in the same weight with little difficulty, it would be found that were they also travellers, the younger man would have much more difficulty in leaving behind the man of fifty did the test happen to take the form of a walk across country for a thousand miles living on the game shot. The younger man would probably arrive in after the older, but whereas the former beyond a certain lassitude might show no signs of exhaustion, the latter might come in to collapse. Had the younger man however arrived so used up as to collapse as did his competitor, there would be little doubt but that he would have won the race. He did not use himself to the last of his energy and so lost, failing simply because the stamina was not in him to make him go the limit.

It struck me that this was the case with Hornby. Nothing would ever cause him to feel that he was beaten until he was so reduced as to collapse suddenly. Where I would admit fatigue he never would. Where I would have made two trips over the portage with the last load he would make one colossal load of the stuff and stagger over, and so on. Apparently the difference is that whereas a young man, when feeling hard put to it to carry on, may feel as though he is in danger of collapsing at any moment, an older man will not consider the thought either until he has collapsed, or until weakness has brought him to his knees already once or twice.

As regards myself, I had retired from the Army in 1923 as an invalid. I had suffered from tropical disease for eight years. During the latter part of my service I was for three years almost constantly in hospital undergoing treatment for a mixed infection of malaria contracted when with the Desert Mounted Corps. I arrived in Canada nominally as a visitor, but became caught up in a hunting trip to the Rocky Mountains. Hardship was experienced and absolutely no time could be wasted by being sick. We starved a little and worked ourselves to skin and bone. The result was that when food was procured I commenced to build up and feel well again, better than I had done for eight years The reason was apparently that the shortage of food and exacting nature of the work caused us to live to a large extent on the less important tissues in our bodies, and that amongst those which I used up were parts that were diseased and causing so much trouble. In any case after that I experienced but one more relapse, about two months later.

During the expedition that followed, that with which we are concerned in this report, I found myself living to a great extent on salted meats from June until September; I was worried the while over extraneous matters and this combined with the diet served to upset my digestion and impair my blood. No symptoms of scurvy were noticeable, but had there been greater periods of inactivity it is probable that a slight attack might have been contracted. In September fresh deer meat was secured, and I immediately took to eating large quantities of it, in fact except for an occasional bannock little else was eaten thereafter for an entire year.

My condition gradually improved, until in February I found myself physically more erect than at any other time, but a severe strain causing bone pressure, and subsequent exposure, resulted in acute sciatica which steadily became more troublesome as time wore on.

After April we commenced to lose strength. During the winter we suffered considerably from discomfort, and exposure, and the almost straight meat diet which we had adopted during winter when the caribou are not in prime condition had

probably failed to do other than make us feel fit, and keep our bodies in normal condition. But just as a man living on a diet of oatmeal and sugar may be able to keep well and strong under certain conditions, the necessity of having suddenly to do a double share of work may find him without the basic strength that might have been there had he been living on a more strengthening food. As I say, although we felt exceedingly well, we discovered that we fell off more rapidly than we would have done had we been living on fatter and richer foods.

The night work in April was heavy, and on one trip I had taken a fall on the ice when travelling to Fort Reliance resulting in a badly sprained ankle. My sleigh was so heavily laden that riding was impossible and although it occasioned me great pain I was unable to rest it longer than for single nights until civilization was reached many months later. For two months it remained in a very swollen condition and even now I find it impossible to wear footwear made before going north. This added to the injury to my back probably contributed to the state of weakness from which I suffered after crossing the portages on the Hanbury River.

At the beginning of May a rest was indulged in, but fat caribou meat was not secured, and although we took on weight again, we probably put on little reserve of strength. This rest was followed by a period of most exacting night work. Our dogs were too few in number, and snow conditions being unfavourable it was rarely possible to take a spell on the sleigh even when travelling back empty for another portion of the load. Thirty miles of every fifty during the night would be occupied hauling as a dog.

Again, although we would often travel in this manner for fifteen hours a night, the other nine could never be taken for sleep. Fuel and meat would have to be procured and both of us would be occupied well on into the day, leaving possibly an average of five hours for sleep.

This continued until about the middle of June, when we found ourselves without any food at all, except an emergency ration carried in case of sickness. It consisted of quarter of a pound of sugar, two ounces of bacon, and one pound of flour. We ate it before making the last portage of the journey, that at the outlet of Schultz Lake.

On the Hanbury river fish were not plentiful, the river is broken by heavy falls and rapids. Most of the northern fish are to be found but the heavy fat fish that are essential when living off the country on a straight fish diet were wanting. It was at MacDonald Falls that we first commenced to feel weak. There a large number of herring gulls were nesting on an island in the middle of the rapid. We tried to secure some but they were wild and we had no success. This was on July 13th, caribou not having been seen for some weeks. Until July 25th we lived on fish and gradually lost condition. Suckers and white fish, and an occasional Back's Grayling we ate for breakfast, lunch, and dinner.

None of this would have troubled us much had we been able to lead a life of rest and ease, but we had the daily grind of the portages with our huge loads, the knowledge of our lateness that necessitated pushing along at the utmost speed at all times, and the endless chores that kept us wakeful when by rights we should have been abed. When approaching Thelon River, gulls were fortunately observed again and we secured a number. At this time of the year they are in excellent condition, still fat from feeding along the coast, and had we been able to rely on them we need never have had any anxiety as to our physical condition. Unfortunately however, they are scarce along this route and only on one occasion did we shoot enough to provide us with an entire day's food. Some of the less fastidious of the whitemen at the trading posts occasionally eat gulls I find, but invariably the young ones. Juvenile birds we found did not possess the nutritious qualities of the old birds, and indeed a straight fish diet is preferable. It is the same with caribou meat, the older the animal the more body there is to the meat even though it may be slightly tough.

Whilst living on fish we experienced some difficulty with the cooking. Gathering fuel takes time in the northern plains, and all the fish caught during the night would be boiled in one large pot and used as required. Although this would be cooled off as quickly as possible, and kept when travelling in as cool a place as possible, it was found that it would soon ferment, particularly if the boiling had failed to evaporate most of the water, whitefish and suckers giving the most trouble. For a while we failed to notice this, but acute gastric trouble caused us to look for a cause. Thereafter we roasted the fish whenever practicable, and when boiling it took care not to add too much water in the first instance.

On July 24th we failed to find a fishing site, and having been on short commons for a considerable period the shortage was making itself felt. So much so that we were extremely grateful to have passed the portages. On the morning of the 25th our nets yielded us one

small trout. Ten of our good dogs had long since been destroyed so that we had no cause for worry on their account, but a working white man when in need of building up requires a large number of fish to keep him going, and with the average fish weighing but four pounds we had for the two of us to catch at least eight of them every day, or their equivalent, to keep us on our feet. We were considering the matter, when in the distance moving forms were observed. This turned out to be the main caribou migration from the north. We met it and killed four animals. Camp was pitched, the deer butchered, and an attempt made to dry the meat. However our efforts proved unsuccessful. Within a few days our entire supply at the bottom of our canoes had became blown and putrid. Many days were then spent with this as our sole diet. For a while we did not notice any harmful effect, but eventually our weakened digestive organs rebelled and the resultant indisposition was painful "dysentery". Fortunately blood was not passed, but there was a considerable flux of mucus that caused some little concern. Motions were extremely frequent and after three days we were more distressed than at any previous time, so that it was but by sheer force of will that we could bring ourselves to do other than the most important duties.

As soon however as it became apparent that to continue eating such meat would enhance our discomfort a special effort was made to discover a good fishing site. Two days were spent in the search and an eddy yielded a fair catch. Boiled and roasted fish were both tried but little relief was experienced. The situation for me with a known tendency to dysentry commenced to look grave, and my lowered condition increased the sciatic pains from the hip to the heel, as well as causing spinal discomfort which developed what has recently been diagnosed as a slight curvature. But something always seems to turn up in the north, and the next morning a fat wolf was shot. Hornby who has had experience of wolf meat held that in our weakened state such rich food would affect us in much the same manner as would a bottle of cream fed to a new-born child. Nevertheless we cut the animal into small pieces and cut off every particle of fat. About a pound and a half of good lard was forthcoming when it had been all rendered down, and for three or four days we lived right royally on fried fish.

One other period of shortage was experienced towards the middle of August. Fat fish were very scarce and the caribou we saw almost all lost calves, and skin poor. Apparently these little animals had become separated from their mothers during the crowding of the migration, or had drifted in from Inland Eskimo country to the north where the cows had been shot. They were frequently seen travelling rapidly along the river bank. One morning found us without fish and such a calf was killed. We butchered it and boiled every part down for fat and rich soup. Head, bones, kidneys, everything went into the pot, but not a single bubble of fat was yielded by the entire carcass.

Without fat, boiling was the only means of cooking possible, and, although we occasionally ate raw meat, this lean stringy stuff did not appeal. Of straight meat a man will, when working hard eat from nine to eleven pounds a day and we had the pots to cook about twenty pounds at a time. When we had cooked the meat before starting on the day's journey, we would drink what we could of the soup, and then because we found that moist meat was apt to sour, the rest would be poured away, the best of the meat (what little best there was) would be lost. The meat left in the pots would look all right, but apart from the fact that it tasted much like grass it had about the same energising properties. In consequence we again commenced to weaken.

On August 22nd Hornby was fortunate enough to shoot the two year old bull caribou already mentioned. This was the first male animal we had seen since the migration, and he was alone. Skinned we found that he had commenced to put on back fat, about a third of a pound being taken. This meant that all the meat was in excellent condition. The head was boiled and eaten, and another pound of fat collected. We stopped right there and feasted until we could eat no more. The weather was cooler, the blow flies had mostly disappeared, and meat could be better cared for. We gorged ourselves on raw marrow, and pounds of the tenderloin that had been laid in the sun for a day and was as tender as sucking pig. All our troubles automatically ceased, gastric disturbances were unknown, and we increased in weight incredibly.

Shortly afterwards a portage of a mile had to be made, and we both admitted that had not fortune come our way we might have been forced to wait on the wrong side of it until it did.

The main difficulty encountered on our journey consisted in the difficulty of procuring fats. When we left our winter camp it was hoped to be able to reach the Thelon River on the snow, without having to make the portages of the Hanbury River. Banking on this we started out with but a month's staple provisions. The

extremely heavy work encountered owing to our heavy loads and the bad snow conditions caused us to eat up all this nutritious food before the portages were reached, as we slaved along day and night in an attempt to avoid what portages we could. The thaw came rapidly and when further dog work was impracticable we were still on the wrong side. However, except for a certain ennui we were still strong by the time the first one on Lac du Bois was reached. But hunting did not come up to expectations, only two caribou were seen, both old bulls skin poor, and evidently on their last legs. It struck us as strange that the wolves had not found and destroyed them. In such wretched condition were they that except for the tongue, we did not trouble to cut from the carcasses more than the hams from each of them.

After the first portage or two the flies and mosquitoes commenced to contribute to our discomfort. We were travelling what we had to consider an unknown river, and as it was necessary to be able to see as far ahead as possible to recognize rough water before we came to it, and in order to keep on the lookout for game, veils and protective measures had to be dispensed with. These pestiferous insects will always attack those whom they sense to be in a weakening condition, and accordingly they worried us. Fortunately we were both well versed in the ways of these pests, Hornby after nineteen years experience of them in the north, and I in the tropics. This was just as well because this year was one of the worst known in recent years, and I have no doubt that many a man would have been seriously tried by them. On one occasion the black flies attacked us so viciously that my beard was a mass of blood, and to rub it was to paint my hand as with a brush of scarlet. The portaging was most irksome at times, especially when carrying a canoe over ground willows, the mosquitoes disturbed would rise in clouds, become caught under the inverted canoe to bite to their heart's content.

These of course are the experiences of all travellers in the treeless plains, but travellers are not always living off the country as were we. When game is scarce and one's vitality is in consequence lowered they are a factor to be considered, as without any doubt a great deal of energy is expended not only in fighting them but in composing oneself to disregard their attentions. Smudges have to be made at all camp sites if personal comfort is a matter of any importance at all, and during the week many hours are spent at the expense of no little labour in collecting from an unsympathetic country the fuel required for the purpose.

Throughout the trip we each had eight heavy and cumbersome loads to take over every portage, and over two and a half miles this entails thirty-seven miles of walking, more than half of it under load. Then there was the constant necessity for speed, everlasting hunting and fishing, and the endless search for fuel. An average night's sleep was five hours at this time. All added to our fatigue. Again there were nights when with an empty larder the net would be put in and possibly hours spent watching the floats in order that the first fish to strike it might be pulled out forthwith and eaten.

And not least was a mental state arising from the knowledge that an enforced wintering on Hudson's Bay would not only result in the loss or deterioration of all our photographical records and biological specimens, but also in our exploitation by the traders to the hilt before we would be able to acquire the necessities to carry us through for another year. Later incidents showed us only too well that this would have occurred had we not managed to escape their clutches. We never dwelt tediously on these thoughts, and not infrequently we both experienced a measure of despondency.

On such an expedition as ours the importance of having congenial companionship must be realized. Matters had not gone very well with us so far as the organization of the business was concerned, and without doubt there were numerous occasions on which controversy might have passed to fiery debate. But this would have been intolerable, living together practically isolated in a wretched hole in the ground measuring but ten feet by seven feet, and I cannot remember any instance of finer feeling being usurped by grossness, or lack of chivalry.

Under such conditions as we lived two men come either to great friendship or great hatred. The slightest tactlessness with its resultant irritation reacts dangerously, it comes to memory anon as inactivity and confinement lend time for narrow and prejudiced reconsideration. Of reproach there must be none, because one must know that in working for the common cause each is doing his utmost; encouragement and assistance must take its place. There must be no thought of avoidance, the indisposition, misfortunes, and incompetence of the one must be the pleasure of the other as permitting him the opportunity to express in action the gratitude that two men can rarely express in words.

So far as general health goes a few notes seem

desirable. Although we weakened from the lack of sufficient nourishment no distressing effects were noticed except for the two mentioned, lassitude, and gastric disturbances. During the time just before securing the bull caribou on the lower Thelon River, a time when we were probably most weak, I happened to cut my foot very badly with an axe, almost severing the first two toes of the right foot. Rest was impossible, and little attention could be paid to the wound, but never have I known a wound to heal so rapidly, and only for three days did it limit my activities to any great extent. There was no discharge of pus at all.

The growth of the hair when living under such conditions as were we is interesting. Both Hornby and I have very thick hair, and no increase in the growth was noticed, but one or two of the others were very thin. The oldest man in the party was practically bald when he entered the country, but on leaving I was surprised to notice that he had regained much of it; it was the same as with one of the others. No doubt the high percentage of vitamines in the foods eaten in the north has something to do with it. Teeth were not observed, but I came across no instance of toothache in our party. This was more a matter of luck than anything, I believe, because most of them were very partial to concoctions of flour and sugar, and both these set up an acidity that goes to introduce decay. Correct and regular cleaning will prevent this trouble and for awhile I thought that some system was being observed, but this was not the case, they very rarely used to clean the teeth. The ordinary white man's diet in the north lending carbohydrates to the saliva is responsible for much trouble in this country, and the Eskimo who have adopted such diets are suffering severely already. Our party probably ate sufficient under-done meat to neutralize harmful acidity.

During the entire winter we had our food pleasantly flavoured with sand. Our dug-out was constructed in the top of a glacial sand esker, and nothing that we did would prevent sand from sifting through the roof into everything. As I held Jordan Valley and Egyptian desert sand responsible for much of my tropical intestinal troubles I experienced no little alarm on account of the amount we daily used to chew and swallow. Surely, I thought, it would bring a recurrence of some indisposition. But it never did, and no matter how callous either of us were with regard to its presence in food, no inconvenience arose at all.

Colds were things unknown. No matter how wet or cold we slept, no matter what draught we sat in we had not a cough nor a sniffle. Apparently it was pneumonia or nothing. Yet as soon as I reached civilization I contracted the most severe cold I have ever had, and it kept me to bed for a couple of days. This, however, was merely caused through change in humidity between the north and the south, the former having a much drier atmosphere. Both Hornby and I when we returned suffered from the heat, and even after being in civilization four months, living on civilized foods and in overheated buildings, the feeling was the same. It often amuses me that people think it strange that a temperature a few degrees below freezing should cause us to muffle up, and not a few I know believe that my practise of dispensing with an overcoat whenever possible is nothing less than a pose. I feel the heat in public and private buildings positively oppressive, long to open up at least one window, and failing that am unhappy until I am permitted the comparative freshness of the street air.

One word about the use of tobacco. As everyone knows the old-timer is always pictured with a pipe between his teeth, very often we see him with it whilst driving his dogs, in pictures. Well so he may, but one thing is certain, that if fast work is to be accomplished running hard all day behind dogs at a slinging trot, that smoker is not only going to suffer for it but he will also fall behind his equal in strength who does not smoke. People have argued with me concerning this matter, but nothing will induce me to believe that smoking does not impair the wind. I am a heavy smoker myself and I know. Not only does a smoker have laboured breathing but, according to the amount he smokes, so is he a nuisance in that sufficient tobacco must be taken along to keep him contented. For a heavy smoker a long trip means several pounds of tobacco, and even though he carried it himself it merely means that the other members of the party have to pack for him an equal weight of something else. And these are not all the drawbacks. One and not the least is the fact that a sudden end to his supply is going to make him a curse to everyone. A smoker deprived of his smoke is an abomination, and it is sickening to see a man take himself so seriously as to beg you not to throw the tea leaves away, and a chewer pull out the lining of his coat pocket, wherein tobacco had reposed, in order to chew that.

In my estimation a chewer is worse than a smoker. I know because I have done both. The chewer requires more tobacco than the

smoke addict, and above all his habits are perfectly disgusting even if the hygienic side of the business can be forgotten.

Whenever I have to get down to hard work, tobacco goes, but I will plead guilty to one pipe a day even when travelling my hardest. I could dispense with that, but I find that it composes me to write my diary no matter how unpropitious the conditions may be for doing so. My diary I always made the first consideration and on the entire trip I only failed to write it on one evening. Moreover I think that this one pipe does not impair my wind, because on those occasions when I have done without it for a period I have noticed no increased vigour.

NOTE:—The human body requires certain vitamines which in this country are supplied by the balanced ration which we use. In the north where foods are not plentiful and of a limited variety one has to try and equalize in vitamine contents the foods at hand. Scurvy develops from lack of certain vitamines, but fresh meat eaten raw or practically so will prevent scurvy. The internal organs are especially valuable as antiscorbutics, i.e.—heart, liver, pancreas, and intestines. Excessive cooking destroys vitamines and re-cooking is fatal to the vitamine contents of any food.

Any cereals such as peas, beans, etc., which can be sprouted in water are a very valuable asset to the northern traveller. These put in warm water in a warm place will sprout in a very few days and can be cooked rapidly and eaten.

(To be continued)

A COLLECTION OF PLANTS FROM POINT ABINO, ONTARIO

By H. D. HOUSE
(New York State Museum, Albany, N.Y.)

A large collection of plants was made in the vicinity of Buffalo, New York, between 1918 and 1927, by Mr. Frank W. Johnson, then residing in Buffalo. In this work he was associated with several other members of the botanical section of the Buffalo Society of Natural Sciences. In 1928 this collection was deposited with the New York State Museum for study.

During the course of his botanical excursions in the vicinity of Buffalo, Mr. Johnson made several trips to Point Abino, Ontario, on the north shore of Lake Erie, and situated about twelve miles west of Buffalo. It is the purpose of this paper to place on record the plants collected there by Mr. Johnson. The dates of his visits are as follows: May 8, 1921, June 19, 1921, June 1, 1923, August 11 and 20–22, 1923; August 23–25, 1924; July 11, 1925 and July 18, 1926. The collection also includes a number of plants collected by Mr. L. C. Davis at Port Maitland and at Turkey Point and Crystal Beach, the two latter stations situated between Point Abino and Buffalo.

Osmunda regalis L.
Adiantum pedatum L.
Pteris aquilina L.
Equisetum arvense L.
" *lævigatum* A. Br.
" *variegatum* Schleich
Lycopodium lucidulum Michx.
Juniperus communis L., var. *depressa* Pursh
" *virginiana* L.
Larix laricina (DuRoi) Koch.
Thuja occidentalis L.
Potamogeton heterophyllus Schreb.
" *perfoliatus* L.
Triglochin palustris L.
Agrostis alba var. *maritima* (Lam.) G. F. W. Mey.
Ammophila arenaria (L.) Link
Andropogon furcatus Muhl.
" *scoparius* Michx., var. *frequens* Hubbard.
Arrhenatherum elatius (L.) Beauv.
Bromus inermis Leyss.
Calamagrostis canadensis (Michx.) Beauv.
Cenchrus pauciflorus Benth.
Deschampsia cæspitosa (L.) Beauv.
Elymus robustus Scrib. & Smith
" *robustus* var. *vestitus* Wiegand (E. *glaucifolius* var. *crescendus* (Rameley) Bush)
Eragrostis minor Host.
" *peregrina* Wiegand.
Festuca elatior L.
" *nutans* Spreng.
Glyceria borealis (Nash) Batchelder
" *septentrionalis* Hitchc. (Port Maitland, Davis).
Hystrix patula Moench
Milium effusum L.
Oryzopsis asperifolia Michx.
Panicum flexile (Gattinger) Scribn.
" *Scribnerianum* Nash
" *tennessense* Ashe
" *virgatum* L.
Poa compressa L.
" *pratensis* L.
Sorghastrum nutans (L.) Nash
Sporobolus cryptandrus (Torr.) Gray.
Digitaria sanguinalis (L.) Scop.
Triplasis purpurea (Walt.) Chapm.
Cyperus rivularis Kunth.
" *Schweinitzii* Torr.
" *strigosus* L.
Eleocharis acicularis L.

Eleocharis capitata (L.) R. Br.
Scirpus americanus Pers.
" *validus* Vahl.
Rynchospora alba (L.) Vahl
Cladium mariscoides (Muhl.) Torr.
Carex communis Bailey
" *convoluta* Mackenzie
" *lanuginosa* Michx.
" *Muhlenbergii* Schk.
" *plantaginea* Lam.
" *prasina* Wahl.
" *tribuloides* var. *reducta* Bailey (*C. projecta* Mackenzie)
Carex tribuloides Wahl.
" *rosea* var. *radiata* (Wahl.) Dewey
" *varia* Muhl.
" *viridula* Michx.
" *vulpinoidea* Michx.
" *tetanica* var. *Woodii* (Dewey) Bailey
Dioscorea villosa L.
Spiranthes cernua (L.) Richard
" *lucida* (H. H. Eaton) Ames
Commelina communis L.
Luzula campestris var. *multiflora* (Ehrh.) Celak;
Juncus alpinus var. *insignis* Fries.
" *balticus* L. var. *littoralis* Engelm.
" *brachycephalus* (Engelm.) Buch
" *nodosus* L.
" *Torreyi* Coville
Allium tricoccum L.
Ornithogalum umbellatum L.
Polygonatum pubescens (Willd.) Pursh
Maianthemum canadense var. *interius* Fernald;
Uvularia grandiflora J. E. Smith
Smilacina racemosa (L.) Desf.
" *stellata* (L.) Desf.
Trillium grandiflorum (Michx.) Salisb.
Populus balsamifera L. (*P. tacamahaca* Mill.)
" *tremuloides* Michx.
Salix cordata Muhl.
" *pedicellaris* var. *hypoglauca* Fernald
Fagus grandifolia Ehrh.
Quercus Muhlenbergii Engelm.
Pilea pumila (L.) Gray
Laportea canadensis (L.) Gaud.
Comandra umbellata (L.) Nutt.
Polygonum arifolium L.
" *amphibium* L. (*P. natans* Eaton)
Chenopodium hybridum L.
" *leptophyllum* Nutt.
Corispermum hyssopifolium L.
Claytonia virginica L.
Arenaria serpyllifolia L.
Stellaria longifolia Muhl.
Silene antirrhina L.
" *Armeria* L.
Actæa rubra (Ait.) Willd.
Anemone canadense L.
" *cylindrica* Gray.
Aquilegia canadensis L.
Clematis virginiana L.
Hepatica acutiloba DC.
Ranunculus abortivus L.
" *recurvatus* Poir.
" *sceleratus* L.
Thalictrum dioicum L.
Alyssum alyssoides L.
Arabis Drummondii Gray
" *glabra* (L.) Bernh.
" *lævigata* (Muhl.) Poir.
" *lyrata* L.
Cakile edentula (Bigel.) Hook., var. *lacustris* Fernald
Cardamine pennsylvanica Muhl.
Sisymbrium Thalianum (L.) J. Gay
Erysimum cheiranthoides L.
Dentaria laciniata Muhl.
Dicentra canadensis (Goldie) Walp.
Chelidonium majus L.
Benzoin aestivale (L.) Nees
Caulophyllum thalictroides (L.) Michx.
Polanisia graveolens Raf.
Sarracenia purpurea L.
Sedum acre L.
Parnassia caroliniana Michx.
Mitella diphylla L.
Tiarella cordifolia L.
Ribes floridum L'her.
" *Cynosbati* L.
Physocarpus opulifolius (L.) Maxim.
" " var. *intermedius* (Rydb.) Robinson
Spiræa alba DuRoi
Potentilla anserina L.
" *recta* L. var. *sulphurea* (Lam.) Lapeyr.
Sanguisorba minor Scop.
Rosa blanda Ait.
" *carolina* L. var. *glandulosa* Farwell (*R. serrulata* Raf.) (Turkey Point, Davis)
Rubus odoratus L.
Amelanchier canadensis (L.) Medic.
Prunus pumila L.
" *susquehanna* Willd. (*P. cuneata* Raf.)
" *virginiana* L.
Amphicarpa monoica (L.) Ell.
Lathyrus maritimus (L.) Bigel. var. *glaber* (Ser.) Eames
Lathyrus palustris L., var. *linearifolius* Ser. (Port Maitland, Davis)
Lespedeza capitata Michx. var. *velutina* (Bickn.) Fernald (Turkey Point, Davis)
Melilotus alba (Medic.) Desr.
Strophostyles helvola (L.) Britton
Geranium maculatum L.

Geranium Robertianum L.
Euphorbia corollata L. Turkey Point, Davis
" *polygonifolia* L.
Evonymus obovatus Nutt.
Acer saccharum Marsh.
Hypericum Kalmianum L.
Viola arvensis Murr. Crystal Beach, Davis.
" *canadensis* L.
" *rostrata* Pursh
Hydrocotyle americana L.
Osmorhiza Claytoni (Michx.) Clarke
Zizia aurea (L.) Koch
Cornus alternifolia L.f.
" *Amomum* Mill
" *Baileyi* Coulter & Evans
" *paniculata* L'Her.
" *circinata* L'Her.
Pyrola elliptica L.
Arctostaphylos Uva-Ursi (L.) Spreng.
Chamædaphne calyculata (L.) Moench
Vaccinium corymbosum L.
" *macrocarpon* Ait.
Lysimachia terrestris (L.) B.S.P.
" *thrysiflora* L.
Steironema quadriflorum (Sims) Hitchc.
Syringa vulgaris L.
Menyanthes trifoliata L.
Convolvulus Sepium L.
Phlox divaricata L.
Hydrophyllum canadense L.
Lappula echinata Gilibert
" *virginiana* (L.) Greene
Lithospermum arvense L.
Myosotis laxa Lehm.
Agastache nepetoides (L.) Kuntze
Satureja glabra (Nutt.) Fernald
" *vulgaris* (L.) Fritsch
Physostegia virginiana (L.) Benth.
Pycnanthemum virginianum (L.) Durand & Jackson
Leonurus cardiaca L.
Scutellaria galericulata L.
" *parvula* Michx.
Teucrium occidentale Gray, var. *boreale* (Bickn.) Fernald
Solanum nigrum L.
Gerardia paupercula (Gray) Britton (*Agalinis paupercula*, var. *borealis* Pennell)
Gerardia tenuifolia Vahl
Pentstemon hirsutus (L.) Willd.
Veronica officicinalis L.
Conopholis americana (L.f.) Wallr.
Epifagus virginiana (L.) Bart.
Galium circæzans Michx.
" *lanceolatum* Torrey
" *Mollugo* L.
" *pilosum* Ait.
" *triflorum* Michx.
Lonicera dioica L.
" *glaucescens* Rydb. (Port Maitland, Davis)
Sambucus racemosus L.
Viburnum acerifolium L.
" *dentatum* L.
" *Opulus* L.
Valerianella chenopodifolia (Pursh) DC.
" *Locusta* (L.) Betske) Crystal Beach, Davis.
Campanula aparinoides Pursh
" *americana* L.
" *rapunculoides* L.
" *uliginosa* Rydb.
Lobelia Kalmii L.
" *syphilitica* L.
Prenanthes alba L.
Achillea Millefolium L.
Artemisia caudata Michx.
Bidens trichosperma (Michx.) Britton, Turkey Point, Davis
Chrysanthemum Balsamita L., var. *tanacetoides* Boiss.
Coreopsis lanceolata L. Turkey Point, Davis.
Erigeron annuus (L.) Pers.
Helianthus decapetalus L.
Liatris cylindracea Michx. Turkey Point, Davis
Polymnia canadensis L.
Solidago graminifolia (L.) Salisb., var. *Nuttallii* (Greene) Fernald.

NOTES AND OBSERVATIONS

THE EUROPEAN STARLING AT RIVIERE-DU-LOUP.—As far as I am aware, the European Starling was observed in Riviere-du-Loup, Quebec, approximately opposite the mouth of the Saguenay River, for the first time on April 11, 1929. On that date I saw one in a Maple tree in the town, and my friend, Mr. Joseph Y. Pommet, observed a flock of six. During the summer of 1929 I observed a pair of these birds at Riviere-du-Loup that seemed to have a nest in an old nesting cavity made by some Woodpecker. —WILSON BAILLAIRGE.

STARLING IN WINTER.—On November 23rd, 1929, I saw a Starling (*Sturnus vulgaris*) feeding in a field near the River Annapolis between Bridgetown and Annapolis Royal, N.S. The weather at the time was cold but settled.—CHRISTIAN W. L. PAULSON.

FIRST NESTING OF THE EUROPEAN STARLING IN NOVA SCOTIA.—The first* recorded European Starling (*Sturnus vulgaris*) for Canada was a bird found dead at Halifax on December 1st, 1915. Since that date the writer has established records of fifteen additional starlings in Nova Scotia but it was not until 1928 that the bird was found to be breeding here. In June of that year a pair took up house-keeping in an old flicker's nest in an ash tree in front of the club house of the Gorsebrook Golf Club in Halifax. Believing the species to be undesirable and desirous therefore to check its invasion of our province, Col. R. B. Willis of Halifax who reported the nest to me on June 26th, was asked to destroy the birds, whereupon the male was shot but the female escaped.

On that date the nest was examined by the writer and was found to contain five eggs which are now in his collection at Wolfville. In June 1929 it is interesting to note that a pair of Starlings appeared at the old nest at Gorsebrook, undoubtedly the same female with a new mate. Both these were collected by Col. Willis, before the eggs were laid, and were presented to the Provincial Museum at Halifax. To date this is the only breeding record of the starling in Nova Scotia which has come to my attention.—R. W. TUFTS.

Wolfville, Nova Scotia, Feb. 13th, 1930.

*There was an attempt at introducing the species in Canada in 1875 at Quebec but the birds failed to persist and as far as we know no other records were produced from them.—ORNITH. ED.

SUNSPOTS IN RELATION TO FLUCTUATIONS IN GRASSHOPPERS AND GROUSE AT AWEME, MANITOBA.—In the April, 1930, issue of *The Canadian Field-Naturalist* (44: 77), Mr. Norman Criddle presents records of the fluctuations in numbers of grasshoppers and grouse at Aweme, Manitoba. It is worthy of note that these fluctuations show a striking relationship to the variations in the spottedness of the sun. The grasshoppers, sharp-tailed grouse and ruffed grouse show maximum points in their curves of numbers, at or near the minima of sunspots (1901, 1913, 1923); and minimum points near maxima of sunspots (1905, 1917, 1928). Mean curves for the three eleven-year sunspot cycles, show striking correlation and smooth variation:

Maxima

Grasshopper.....at sunspot minimum,
Sharp-tailed grouse...at sunspot minimum and next 2 years,
Ruffed grouse.....at sunspot minimum and next 2 years.

Minima

Grasshopper.....one year before sunspot maximum,
Sharp-tailed grouse...one year after sunspot maximum,
Ruffed grouse.....one year after sunspot maximum.

It would seem that the lesser organism, the grasshopper, responds quickly to the sunspot influence, while the grouse lag a little, and may well reflect a grasshopper influence, as Criddle suggests. However—as has been demonstrated in the cases of tree-growth, numbers of varying hares, and dates of arrival of birds—all three, grasshopper, sharp-tailed grouse and ruffed grouse, do reflect the eleven-year sunspot cycle, whatever be the mechanism (a problem in each case). Grasshoppers will probably be again at a maximum in 1934, at Aweme, and grouse in 1934-6.

At the Dominion Observatory, Ottawa, we have been investigating for some years the relationship of sunspot variations to living things and we should be happy to receive from any readers such valuable and faithfully kept records as these under discussion. Such records are especially desired in connection with the investigation of the change in phase for different parts of Canada, of the sunspot relationship to natural phenomena.—RALPH E. DELURY, Ottawa.

BOOK REVIEW

OUR WILD ORCHIDS, TRAILS AND PORTRAITS, *by Frank Morris and Edward A. Eames. With 130 full-page illustrations, four in colour, octavo. Scribners. $7.50.*

It never rains but it pours is a good old saying which seemed well exemplified the other day in Montreal, where in a stationer's shop two copies of this book were displayed with a suitable printed card, setting forth the attractions of the work, whilst in a nearby florist's window, a large crowd were gazing on several magnificent cut blooms of a Cattleya—I forget which species—a large printed card informing the public that never before in the history of Canada had it been possible to offer such blooms at fifty cents each! ! Truly, things seemed to be running riot in "Orchidland", for here were magnificent blooms being literally given away, judging from the notice, whilst, the same thing might be said of the book, seeing that the 130 exquisite plates work out at about six cents each.

Anyone familiar with the writings of Frank Norris, or the pictures of Edward Eames, would naturally come to one conclusion as to the result of such a combination of authors, namely, a perfectly delightful record of the doings of two orchid enthusiasts spread over a number of years which may be all the authors intended. To those who had long been hoping that the next orchid book would be a thoroughly up-to-date one embracing all that was known concerning our wild orchids the present volume will come as a disappointment, since no reference whatever is made, even, to the old and well recognized varieties, to say nothing of the more recent ones, including one new species, the omission of any reference as to the extent of variation, if any, each species is liable to, the method of propagation, fertilization, and underground development, the out-of-date heights given for many of the species, the lack of a bibliography, and the fact that when references are given to recent work accomplished they invariably go in one or two directions only. Evidently the perfect orchid book is a long way off yet, but in the meantime the present volume fills a long-felt want, and will surely prove a source of delight to those about to study our wild orchids in their native haunts, the explicit text, and beautiful plates, enabling the student to name and determine off-hand most of the species he is likely to come across.—H.M.

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SOME NOTES ON BIRDS OF THE GASPE PENINSULA IN NOVEMBER

By HARRISON F. LEWIS

IT fell to my lot to visit the Gaspé Peninsula from November 9 to 13, 1929, and, as records of the bird life of that region at that season are few, the following account of the observations then made is placed on record. I travelled by rail along the south shore of the peninsula to Percé, in the vicinity of which I spent November 10, which was a beautiful, clear autumn day, although rather cold. Activities on this day included the climbing of Rosy Peak, north of Percé, and the encircling of Bonaventure Island in a motorboat with the congenial companionship of William Duval, the local game warden and student of bird life. Leaving Percé on the morning of November 11, I returned along the south shore by easy stages, making stops at New Carlisle, Carleton, and Oak Bay Mills, and travelling in part by taxicab and motor coach and in part by rail. During the three days occupied by this return journey the weather was cloudy and mild, with light, variable winds.

1. *Gavia immer.* LOON.—At New Carlisle one was observed on the 11th and four on the 12th.

2. *Cepphus* sp. GUILLEMOT.—When encircling Bonaventure Island on the 10th, 15 Guillemots, either Black Guillemots (*C. grylle*), or Mandt's Guillemots (*C. mandti*), or both, were observed.

3. *Alle alle.* DOVEKIE.—Seven scattered Dovekies were observed during the sail around Bonaventure Island.

4. *Larus marinus.* GREAT BLACK-BACKED GULL.—Four of these birds were seen with a flock of Herring Gulls at Percé on the 10th.

5. *Larus argentatus.* HERRING GULL.—This species was fairly common all along the coast where I travelled. Two flocks of about 75 birds each, including both adults and young, were observed, one at Percé on the 10th and one at Port Daniel on the 11th, and smaller numbers were observed at several other places.

6. *Moris bassana.* GANNET.—At Bonaventure Island, on November 10th, I saw four large young Gannets on the ledges occupied by this species for nesting purposes, and one other young one, which had apparently just left its natal ledge, was seen swimming in the water close to the base of the cliff. Three adult Gannets were observed flying in the vicinity, but not very near the cliff where they nest. Of all the thousands of Gannets that make Bonaventure Island their home in summer, no others were to be seen.

It is doubtful if, on the date of these observations, any young of any other species of native bird remained at their nests anywhere in eastern Canada. As the bright morning sun warmed the great cliffs of Bonaventure Island, large icicles loosed their hold from the higher prominences and fell crashing upon the rocky shelves below, or dropped direct into the sea. The young Gannets on their home ledges were in great jeopardy of being instantly killed by these falling ice-masses, surely an unusual predicament for nesting birds!

7. *Mergus americanus.* AMERICAN MERGANSER.—Seven birds of this species were identified at Oak Bay Mills on the 13th. Near Bonaventure Island, on the 10th, I saw a female or young Merganser that may have been either this species or the Red-breasted Merganser (*M. serrator*).

8. *Anas rubripes* subsp. BLACK DUCK.—Six Black Ducks were observed at Oak Bay Mills on the 13th.

9. *Glaucionetta islandica.* BARROW'S GOLDENEYE.—At Bonaventure Island, a group of three Golden-eyes, of which one was an adult male and the two others were females or young, was seen close to the low western cliff of the island on November 10th. The adult drake was recognized as a Barrow's Golden-eye by the high, crescent-shaped white mark between bill and eye, which was seen through X6 binoculars at comparatively close range, and the two other birds were presumably of the same species, although there was not time to examine them closely before all three birds flew away.

10. *Clangula hyemalis.* OLD SQUAW.—Old Squaws were common in scattered flocks at Percé and New Carlisle, and probably all along the

intervening coast. Two hundred were seen at Percé on the 10th. This species was also common at Bic, on the south side of the lower St. Lawrence, on November 8th.

11. *Somateria* sp. EIDER.—A flock of about 15 Eiders in brown plumage was seen at a little distance near Bonaventure Island on the 10th.

12. *Oidemia perspicillata.* SURF SCOTER.—An adult drake was seen near Bonaventure Island.

13. *Branta canadensis canadensis.* CANADA GOOSE.—Twenty-three were counted near Oak Bay Mills on November 13th. Of several flocks of *Branta* seen from a motor coach between Carleton and Oak Bay Mills on the same date, some were probably of this species.

14. *Branta bernicla glaucogastra.* BRANT.—On the morning of November 13th, 99 Brant in one flock were seen feeding peacefully, about a gun-shot from shore, directly in front of the busy little village of Carleton. A little later on the same morning a flock of about 75 of these birds was seen in a similar situation at St. Omer. Of other flocks of *Branta,* of about the same size, seen between Carleton and Oak Bay Mills from a moving motor coach that morning, some were probably of this species. Two hundred Brant in scattered flocks, were counted on the waters of Bay Chaleur near Oak Bay Mills.

15. *Dryobates villosus villosus.* HAIRY WOODPECKER.—One was observed at New Carlisle on the 11th and one at Oak Bay Mills on the 13th.

16. *Otocoris alpestris* (subsp?). HORNED LARK.—A flock of six was seen near shore at Percé on the 10th.

17. *Cyanocitta cristata cristata.* BLUE JAY.—One was observed at Oak Bay Mills on the 13th.

18. *Corvus corax principalis.* RAVEN.—One was observed near Cape Cove on the 11th.

19. *Corvus brachyrhynchos brachyrhynchos.* CROW.—The only Crows observed were one at Percé on the 10th and two at Oak Bay Mills on the 13th.

20. *Sturnus vulgaris.* STARLING.—Three were seen at close range at Oak Bay Mills on November 13th. This is apparently the first record for this species in that vicinity.

21. *Pinicola enucleator leucura.* PINE GROSBEAK.—On November 10th I watched 12 Pine Grosbeaks, including three rosy males, while they were feeding for half an hour or more in oat-stubble in a small field, partly surrounded by spruces, high on the southern side of Rosy Peak. The flock, after descending into the stubble from the tops of the neighboring trees, scattered somewhat and hopped about on the ground. Once or twice one of the birds appeared to hull a grain of oats, but for the most part they picked up something else, invisible to me, which was probably weed-seed. The noise made by their mandibles as they ate was practically continuous and resembled that made by a canary when hulling seeds.

A Pine Grosbeak was heard, but not seen, at Oak Bay Mills on the 13th.

22. *Loxia* sp. CROSSBILL.—One Crossbill was seen at Percé on the 10th, and, at New Carlisle, twelve were seen on the 11th and one on the 12th but in no case was I able to recognize the particular species present.

23. *Acanthis linaria linaria.* REDPOLL.—Two Redpolls were seen at Percé on the 10th and fifteen at New Carlisle on the 12th.

24. *Spinus pinus pinus.* PINE SISKIN.—One was observed at New Carlisle on the 12th.

25. *Plectrophenax nivalis nivalis.* SNOW BUNTING.—I saw thirteen at New Carlisle on the 12th and thirty-four at Oak Bay Mills on the 13th.

26. *Certhia familiaris americana.* BROWN CREEPER.—One was found in a wooded swamp at Oak Bay Mills on the 13th.

27. *Penthestes atricapillus atricapillus.* CHICKADEE.—One was observed at Oak Bay Mills on the 13th.

28. *Penthestes hudsonicus* (subsp?). ACADIAN CHICKADEE.—Two were noted at Percé on the 10th and one at Oak Bay Mills on the 13th.

29. *Planesticus migratorius migratorius.* ROBIN.—Among scattered conifers of rather small size, on the sandy, level area in front of New Carlisle, I saw five Robins on the 11th and sixteen on the 12th.

OBSERVATIONS ON THE MOVEMENTS OF THE PIKE (Esox lucius)

By R. A. McKENZIE

IT is a fact well-known to everyone that many animals wander over the face of the globe to a greater or lesser extent. These wanderings are prompted chiefly by two stimuli, namely, the desire for food and the urge to mate, nest or spawn. The former might bring about practically constant wandering of the animals, while the movements or migrations caused by the latter are almost arrested at least during the period of deposition and hatch-

ing of the eggs. The nesting and rearing of their young confine birds to limited areas. It is found also that some species of fish build nests and guard their young, as for example, bass and sticklebacks. The great majority of fishes, however, spawn and move away from the spawning beds shortly after spawning. There is no apparent reason for these fish, which do not guard their nests, eggs and young, to remain in one vicinity. This is more particularly the case if they are carnivorous fish living in a lake in which their prey, small and young fish, are found widely scattered. This is especially true of the pike, a non-nest builder, which frequents the shallower water where small fish are usually numerous.

There is practically nothing recorded about the movements of the pike. Thoreau (1817–1862) states, and Nash and Jordan quote him without disagreement as saying, that the pike (*Esox lucius*) is "a solemn stately ruminant fish, lurking under the shadow of a lily-pad at noon, with still, circumspect, voracious eye, motionless as a jewel set in water, or moving slowly along to take up its position; darting from time to time at such unlucky fish or frog or insect as comes within its range, and swallowing it at a gulp. Sometimes a striped snake, bound for greener meadows across the stream, ends its undulatory progress in the same receptacle." Up to the present there is little, if any, evidence to show whether or not this fish lurks under the same lily-pad or in the shadow of the same rock or fallen tree-trunk from which he makes foraging expeditious into his surrounding territory. The speckled trout is believed by many anglers, and has been shown by H. C. White (1924 and 1930), to exhibit in a marked degree the characteristic of pool domination.

During the summer of 1926 some information was obtained on the movements of the pike. At the same time the Ontario Fisheries Research Laboratory of the University of Toronto, was located on Shakespeare Island Lake, Lake Nipigon, Ontario. As pike were plentiful in this lake, the author took advantage of the opportunity to carry on some tagging experiments which were incidental to the main investigations of the laboratory. The author wishes to acknowledge the co-operation of Professor W. J. K. Harkness, who was supervising the work of the laboratory, Mrs. Harkness and Dr. A. L. Pritchard.

Tagging operations were carried out during the months of July and August. The pike to be tagged were caught by trolling from a canoe, and the course followed was parallel to, and rarely more than one hundred feet from the shore. The fish used in this study were taken, with some exceptions, between the hours of five and nine in the evening.

After being brought into the boat the fish were released from the hooks. During this operation they were held on the bottom of the canoe by one person while another extracted the hooks with as little injury as possible to the gills and throat. A monel metal tag was then clamped through the base of the caudal fin and allowed to hang down around the under-side of the fin. The fish was then released. The tag number, the date and the place where the fish was released were all recorded.

During the time spent on this investigation sixty-one pike were tagged and released. Two of the tags, having become detached from the fish, were found lying in the shallows at the places where the fish were tagged—one three weeks and the other five weeks after tagging.

Five of the tagged fish were found dead along the shore. The lake is small, scarcely more than a mile in any direction, and as the members of the laboratory were working on all parts of the lake daily, it is improbable that any of the tagged fish died and escaped notice. None of the dead fish showed excessive growth of fungus about the tag, so in probability the mortality was due to injuries received from the hooks.

These fish were found from two to nine days after being tagged—three of them in the places released. The other two were found within a hundred and fifty yards of where they had been released. One of these, from the nature of its final location, must have moved of its own accord westward along the shore about a hundred and fifty yards; the other could easily have drifted, from the exposed point where it was released, across the mouth of a bay to the point where it was found—a distance of about fifty yards. From this it may be seen that only one of the five fish found dead need necessarily have moved voluntarily from the place where it was released.

Ten of the tagged fish were retaken and found to be in a healthy condition. The details concerning the movements of these fish are presented in the accompanying table.

On the accompanying map are indicated the points at which the tagged fish were released, and the distance and direction to the points where the ten fish were recaptured.

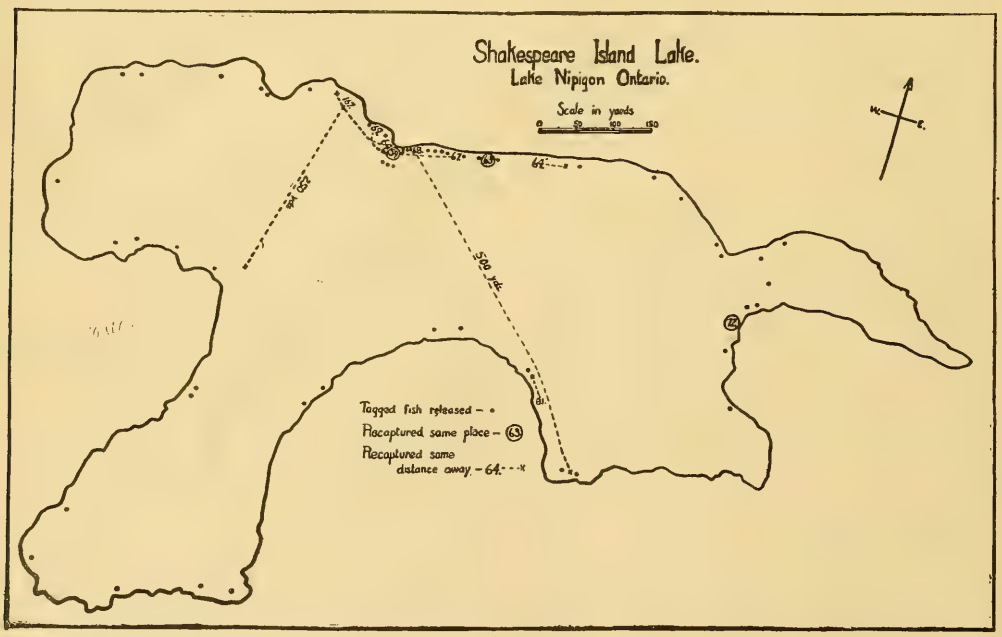
An examination of the table and map shows some interesting points. Three of the ten recaptured fish, three of the dead fish and the two detached tags were taken or found at the points where the fish bearing their respective

DATA ON RECOVERED TAGS

Tag Number	Date when tagged	Point of recapture relative to place of release	No. of days intervening between tagging and recapture
No. 59	July 7, 1926	Same place	4
No. 63	July 9, 1926	Same place	1
* No. 65	July 10, 1926	Tag found same place	34
† No. 66	July 11, 1926	Dead, same place	2
* No. 78	July 12, 1926	Tag found same place	22
No. 71	July 12, 1926	Same place	22
† No. 24	Aug. 3, 1926	Dead, same place	3
† No. 127	Aug. 4, 1926	Dead, same place	9
No. 69	July 11, 1926	25 yards east	23
No. 81	July 13, 1926	30 yards west	16
† No. 92	July 29, 1926	Dead, 50 yds. north, across mouth of bay	—
No. 64′	Aug. 3, 1926	50 yards east	15
No. 67	July 11, 1926	80 yards west	21
No. 64	July 9, 1926	100 yards west	23
† No. 90′	Aug. 3, 1926	Dead, 140 yds. west along the shore	—
No. 167	Aug. 3, 1926	250 yards south-west across the lake	14
No. 68	July 11, 1926	500 yard south-east across the lake	2

NOTE:—Tags 64′ and 90′ were from a series of small tags, while the others were large tags.
* Tags detached from fish.
† Fish dead when found.

tags were released. Five of the living fish and the remaining two dead ones were taken within one hundred and fifty yards of the point of tagging. The other two fish had traversed a considerable distance—two hundred and fifty and five hundred yards. Only three of the living fish were recaptured within two weeks from the time of release, and one of these, captured on the second day after tagging, had travelled the greatest distance. This indicates that all these fish had ample time to move to other parts of the lake.



Trolling and netting were carried on in all parts of the lake, but pike were taken only in proximity to the shore. A larger number of pike were taken along the north shore of the lake than elsewhere, which indicates that this is an excellent pike habitat. However, an examination of the map indicates that they were taken along all parts of the shore-line. This shows that the whole lake shore is more or less suitable for pike, and consequently there is nothing to prevent a fish moving from one location to another.

Of the sixty-one fish which were tagged, only five are known to have died and two to have lost their tags while the ten which were recaptured were found to be in good condition. From this we assume that the remaining forty-four were alive and bearing their tags. If this is the case, this method of tagging is approximately 88% efficient, there being a loss of seven in sixty-one.

Of the ten fish which were retaken alive, eight were caught in approximately the same place as they were released. It may be seen from these figures that 80% of these fish appear to have their respective retreats.

MAMMALS OF POINT GREY

By IAN McTAGGART-COWAN

POINT GREY is the name given to the point of land that lies to the west of the City of Vancouver. This point is bounded on one side by the mouth of the North arm of the Fraser river, and on the other side by the waters of Georgia strait and Burrard inlet.

On the west the point ends abruptly and drops off in sheer sand cliffs; in between these cliffs the steep banks are of a rather moist nature and support a heavy growth of salmon berry, devil's club, and sword fern, with numerous Douglas fir, cedar, maple and alder trees.

Proceeding inland a short distance there is a noticeable decrease in the number of conifers present; instead of these the dominant tree is the alder, with a few maples; here the undergrowth is not quite so dense, but there is a great number of fallen trees and stumps. The ground is drier and there is a fair covering of leaf mould over the somewhat sandy subsoil. Further inland still is a recent burn, on which there is very little vegetation except salal, bracken and willow. In this there are one or two marshy areas.

On the southwestern side, bordering on the mouth of the Fraser river there is a strip of flat meadowland between the steep banks and the water.

So far as mammals are concerned Point Grey is rather peculiarly situated in that it is completely shut off, by the city, from all communication with other areas of wild land.

Civilization is fast encroaching on the remaining wild areas so that in a few years hardly any of the more timid species will be found here. On the northwest corner are the lands and buildings of the University of British Columbia; on the east and south, building and road-making are going on apace.

The following species have, unless otherwise stated, been taken by the writer during the past three years, or are in the collection of Mr. Kenneth Racey to whom the writer wishes to extend his sincerest thanks.

Scapanus orarius schefferi Jackson. SCHEFFER'S MOLE.—Fairly abundant in all cultivated areas, but found only occasionally in the deciduous areas adjoining cultivation. Specimens have been taken in the Botanical Gardens. Not as yet noted in the burnt areas or in the damp coniferous belt. It seems to prefer a somewhat sandy soil in which to burrow.

Neurotrichus gibbsii gibbsii (Baird). GIBBS SHREW MOLE.—Very common in deciduous belt where nearly every log has a network of burrows under it, however the numbers are not as great as one would imagine from the number of burrows, for each individual has quite an extensive network of these and it is only very seldom that more than two individuals are taken in a single set of workings.

Sorex vagrans vagrans Baird. WANDERING SHREW.—Very widely spread throughout the entire district. I have taken it in the runways of *Neurotrichus* and *Microtus serpens* in the woods to the west of the University buildings, but most commonly in the runways of *Microtus townsendi* in the small marshy area behind the University Library.

Sorex obscurus setosus Elliot. DUSKY SHREW.—Not as abundant as the last species but fairly common in the wooded areas everywhere on the point. In places by lifting up the covering of fallen leaves a network of tiny runways is exposed. These runways are the work of shrews but whether of this or the preceding species I am unable to state.

Lasionycteris noctivagans (Le Conte). SILVER-HAIRED BAT.—Known from a single specimen, a

female No. 310, in the writer's collection which was found hibernating under a loose strip of cedar bark about twelve feet off the ground on February 27, 1929.

Procyon lotor pacifica (Merriam). PACIFIC RACOON.—Rare, known only from its tracks which the writer observed on the beach in the fall of 1927.

Mustela streatori (Merriam). STREATOR'S WEASEL.—Rare, single specimen, a male, No. 1028, was taken by Mr. A. S. Walker on March 24, 1923, and is now in the collection of Mr. K. Racey. Since that time I do not know of any specimens being seen or taken.

Mustela vison energumenos (Bangs). NORTHWESTERN MINK.—Not common. Its tracks have been observed on the beach several times and the animal itself seen on one occasion in the spring of 1928.

Spilogale phenax olympica (Elliot). PUGET SOUND SPOTTED SKUNK.—The most abundant representative of the weasel family. There is a single male specimen taken in May, 1928, in the writer's collection and a female No. 17, taken by Mr. A. S. Walker on October 19, 1922, in the collection of Mr. K. Racey. This skunk seems to prefer damp places and its tracks are frequently seen beside a small river that runs through the Indian Reserve.

Eutamias townsendii (Bachman). TOWNSEND'S CHIPMUNK.—Not very common. One or two animals have been seen in the southern part of the district, but I do not know of any specimens having been taken.

Sciurus douglasii Bachman. DOUGLAS SQUIRREL.—By far the most abundant of the larger mammals found in this district. Wherever maple trees abound these squirrels are very much in evidence. I have found nests inside hollow cedars and in hollow maple trees. Nests were characteristic of the species and made of moss and dry leaves with a lining of cedar bark.

Ondatra zibethica osoyoosensis (Lord). MUSKRAT.—Abundant everywhere along the lower Fraser and its tributary streams wherever the country is suitable. No houses are constructed, the animals living in burrows in the banks of streams.

Peromyscus maniculatus austerus (Baird). WHITE FOOTED MOUSE.—Fairly abundant in nearly all localities. Specimens have been taken in th marsh along with *Microtus townsendii*, and in the woods where they prefer up-turned roots and fallen logs. When the snow is on the ground they sometimes travel quite long distances, often a number of them going together and making a path in the snow. All the tracks in this path will point the same way, showing that the path was not made by the passing and repassing of one or two individuals.

Microtus townsendii (Bachman). TOWNSEND'S VOLE.—Not common. A single male specimen was taken in the marsh behind the Library in the fall of 1927, when they were fairly numerous. Intensive trapping in 1928 and 1929 failed to produce a single specimen.

Microtus serpens Merriam. CREEPING VOLE.—Fairly abundant in alder woods where their burrows can be found ramifying under logs, moss, etc.

Mus musculus Linnæus. HOUSE MOUSE.—Found around all the buildings and barns of the University but it does not seem to have taken to the woods and fields.

Rattus rattus rattus (Linnæus). BLACK RAT.—Known from a single partly disintegrated specimen found lying on a trail to the west of the University buildings.

Rattus norvegicus (Erxleben). NORWAY RAT.—Found around the barns of the University farm but it has not become naturalized to the extent that the previous species has.

Zapus trinotatus trinotatus Rhoads. JUMPING MOUSE.—Not common. A single female specimen No. 126, collection of Mr. K. Racey, was taken by him on June 11, 1927, in a ditch at the end of 16th Avenue.

Lepus washingtonii Baird. WASHINGTON HARE.—Very common. Owing to the killing off of the predatory animals and birds this animal has increased remarkably. When the snow is on the ground its tracks can be seen almost anywhere on the roads and trails of the campus. Owing to the fact that they do not make definite paths, but just wander at large, they are hard to snare. The writer has a single specimen taken in the spring of 1929.

Department of Zoology,
University of British Columbia.

COLEOPTERA FOUND IN THE RAINY RIVER DISTRICT, ONT.

By J. F. BRIMLEY.

IN the preparing of this list the writer has had much assistance from H. C. Fall, Emil Liljeblad, who identified the *Mordellidæ*, and C. A. Frost. This help has been greatly appreciated. The numbers refer to the earliest and latest months in which taken.

CICINDELIDAE.

Cicindela purpurea Oliv.
Cicindela repanda Dej. 5. 9.
Cicindela longilabris Say. 5. 6.

CARABIDAE.

Sphaeroderus lecontei Dej. 4. 5.
Carabus maeander Fisch. 10.
Calosoma calidum Fab. 5. 8.
Nomius pygmaeus Deg. 6. 7.
Bembidion cheyennense Csy. 9.
Bembidion patruele Dej. 4. 9.
Bembidion quadrimaculatum L. 4. 8.
Tachyta nana Gyll. 5. 10.
Euferonia coracina Newn. 5. 7.
Poecilus corvus Lec. 5.
Poecilus lucublandus Say. 4. 5.
Omaseus caudicalis Say. 5. 10.
Pseudargutor erythropus Dej. 9.
Micromaseus femoralis Kby. 4. 9.
Bothriopterus pennsylvanicus Lec. 4. 10.
Bothriopterus luczoti Dej. 6. 9.
Curtonotus pennsylvanicus Hayw. 5. 9.
Bradytus apricarius Payk. 7.
Percosia obesa Say. 9.
Amara impuncticollis Say. 4. 10.
Amara fallax Lec. 10.
Amara cupreolata Putz. 4. 9.
Amara crassispina Lec. 5.
Triaena pallipes Kby. 10.
Pristodactyla impunctata Say. 5.
Platynus decens Say. 5.
Platynus anchomenoides Rand. 6.
Platynus melanarius Dej. 4. 5.
Platynus cupripennis Say. 6.
Platynus placidus Say.
Platynus cupreus Dej. 4. 9.
Platynus bogemanni Gyll. 6. 7.
Platynus quadripunctatus Dej. 5. 10.
Platynus sordens Kby. 5. 10.
Platynus ruficornis Lec. 4.
Platynus gemellus Lec. 6.
Platynus lutulentus Lec. 7.
Platynus obscurus Hbst. 4.
Lebia pumila Dej. 6. 9.
Lebia fuscata Dej. 6. 7.
Metabletus americanus Dej. 5. 6.
Chlaenius aestivus Say. 6.
Chlaenius sericeus Forst. 5. 6.
Anomoglossus emarginatus Say. 5.
Harpalus pennsylvanicus DeG. 7.
Harpalus herbivagus Say. 5. 10.
Harpalus fallax Lec.
Anisodactylus nigerrimus Dej. 9.
Anisodactylus nigrita Dej. 10.
Anadaptus baltimorensis Say. 5. 10.
Trichocellus ruficrus Kby. 5. 10.
Agonoderus pallipes Fab. 5. 9.

HALIPLIDAE.

Haliplus ruficollis DeG. 7.

DYTISCIDAE.

Bidessus affinis Say. 7.
Agabus discolor Harr. 6.
Ilybius subaeneus Er. 7.
Ilybius angustior Gyll. 6.
Ilybius biguttulus Germ. 7. 9.
Ilybius confuscus Aube. 7.
Rhantus binotatus Harr. 7.
Colymbetes sculptilis Harr. 5. 7.
Dytiscus fasciventris Say. 7.
Dytiscus sublimbatus Lec. 6.
Dytiscus dauricus Gebl. 5.
Dytiscus verticalis Say. 7.
Graphoderes cinereus L. 7.

GYRINIDAE.

Gyrinus minutus Fab. 6.
Gyrinus confinis Lec. 9.
Gyrinus maculiventris Lec. 5. 8.

HYDROPHILIDAE.

Helophorus tuberculatus Gyll. 5. 10.
Helophorus oblongus Lec. 7.
Helophorus lacustris Lec. 6.
Helophorus lineatus Say. 4. 7.
Hydrochus squamifer Lec. 7.
Hydrous triangularis Say. 5. 6.
Hydrophilus obtusatus Say. 7.
Tropisternus glaber Hbst. 6.
Tropisternus lateralis Fabr. 6.
Enochrus perplexus Lec. 4. 7.
Sphæridium scarabæoides. L. 5.
Cercyon prætextatus Say. 6.
Cercyon pygmæus Illig. 7.
Cercyon granarius Er. 6.
Cercyon analis Payk. 6.
Cryptopleurum minutum Fabr. 5.

SILPHIDAE

Necrophorus vespilloides Hbst. 9.
Necrophorus tomentosus Web. 8. 10.
Silpha lapponica Hbst. 5.
Silpha noveboracensis Forst. 5.
Choleva terminans Lec. 6.
Hydnobius latidens Lec. 9.

Leiodes discolor Melsh. 5.
ORTHOPERIDAE.
Sacium lugubre Lec. 4.
STAPHYLINIDAE.
Micropeplus tesserules Curtis. 10.
Megarthrus americanus Sachse. 6.
Anthobium horni Fauv. 6. 7.
Anthobium pothos Mann. 6.
Phyllodrepa punctiventris Fauv. 4.
Phyllodrepa florale Payk. 7.
Omalium humerosum Fauv. 9.
Bledius fumatus Lec. 6. 7.
Stenus bipunctatus Er. 4.
Stenus vicinus Csy. 7.
Stenus flavicornis Er. 7. 9.
Stenus annularis Er. 7.
Stenus tarsalis Ljungh. 7.
Stenus canadensis Csy. 7.
Stenus croceatus Csy. 7.
Paederus littorarius Grav. 4; 5.
Stilicus biarmatus Lec. 4.
Astenus binotatus Say. 6.
Astenus discopunctatus Say. 4. 5.
Nudobius cephalus Say. 4. 10.
Gyrohypnus hamatus Say. 5. 9.
Gyrohypnus pusillus Sachse. 8.
Philonthus politus L. 6. 10.
Philonthus lomatus Er. 9.
Philonthus cyanipennis Fab. 6.
Philonthus brunneus Grav. 5. 10.
Philonthus nigritulus Grav. 4.
Staphylinus badipes Lec. 5. 9.
Staphylinus pleuralis Lec. 5.
Staphylinus violaceus Grav. 6.
Creophilus villosus Grav. 5.
Quedius ferox Lec. 9.
Quedius mesomelinus Marsh. 4.
Quedius sublimbatus Makl. 4.
Tachinus luridus Er. 5.
Tachyporus chrysomelinus L. 4. 10.
Tachyporus nitidulus Fab. 4. 5.
Erchomus ventriculus Say. 5. 10.
Conosoma imbricatus Csy. 9.
Bolitobius anticus Horn. 4.
Aleochara pleuralis Csy. 7.
Baryodma nitida Grav. 7.
SCAPHIDIIDAE.
Scaphidium piceum Melsh. 10.
Scaphisoma convexum Say. 9.
Scaphisoma impunctatum Reit. 6.
Baeocera concolor Fab. 9.
Baeocera congener Csy. 9.
HISTERIDAE.
Hister foedatus Lec. 6. 7.
Hister depurator Say. 6. 9.
Platysoma depressum Lec. 5. 10.
Platysoma coarctatum Lec. 5.
LYCIDAE.
Calopteron reticulatum Fab. 8.
Caeniella dimidiata Fab. 6. 7.
Lopheros fraternus Rand. 7.
Eros thoracicus Rand. 6. 7.
Eros aurora Hbst. 5. 6.
Eros humeralis Fab. 7.
Plateros canaliculatus Say. 7.
LAMPYRIDAE.
Lucidota atra Fab. 6. 7.
Lucidota corrusca L. 4. 9.
Lucidota autumnalis Melsh. 4. 9.
Pyractomena angulata Say. 7.
Pyractomena lucifera Melsh. 7.
Photinus ardens Lec. 6.
Photuris pennsylvanica DeG. 7. 8.
CANTHARIDAE.
Podabrus frater Lec. 7.
Podabrus basillaris Say. 6.
Podabrus diadema Fab. 6.
Podabrus modestus Say. 6. 7
Podabrus piniphilus Esch. 6.
Cantharis excavatus Lec. 6.
Cantharis fraxini Say. 7.
Cantharis carolinus Fab. 7.
Cantharis lineola Fab. 6. 8.
Cantharis rectus Melsh. 6. 7.
Cantharis scitulus Say. 8.
Cantharis tuberculatus Lec. 6. 7.
Silis percoomis Say. 6.
Malthdes concavus Lec. 6.
MELYRIDAE.
Malachius ulkei Horn. 6.
Anthocomus erichsoni Lec. 7.
Attalus otiosus Say. 6. 7.
CLERIDAE.
Thanasimus undulatus Say. 6.
Enoclerus quadriguttatus Oliv. 6.
Enoclerus ichneumoneus Fab. 7.
Enoclerus quadrisignatus Say. 6.
Trichodes nutalli Kby. 6. 9.
CORYNETIDAE.
Chariessa pilosa Forst. 7.
Necrobia violacea L. 5.
CEPHALOIDAE.
Cephaloon lepturides Newn. 6.
OEDEMERIDAE.
Asclera puncticollis Say. 6. 7.
MORDELLIDAE.
Mordella quadripunctata Say. 7.
Mordella melaena Germ. 7.
Mordella marginata Melsh. 7. 8.
Mordella albosuturalis Lilj. 6. 7.
Mordellistena bicinctella Lec. 7.
Mordellistena ornata Melsh. 7. 9.
Mordellistena scapularis Say. 6. 7.
Mordellistena cervicalis Lec. 7.

Mordellistena aspersa Melsh. 7.
Mordellistena pustulata Melsh. 7.
Mordellistena convicta Lec. 7.
Anaspis nigrina Csiki. 7.
Anaspis flavipennis Hald. 5. 7.
Anaspis rufa Say. 6. 8.

MELOIDAE.
Macrobasis unicolor Kby. 7. 9.

PYTHIDAE.
Lecontia discicollis Lec. 5. 7.
Pytho planus Hbst. 7. 9.
Salpingus virescens Lec. 7.

PYROCHROIDAE.
Schizotus cervicalis Newn. 6. 7.
Dendroides bicolor Newn. 6. 7.
Dendroides concolor Newn. 6. 7.

PEDILIDAE.
Pedilus lugubris Say. 6. 7.

ANTHICIDAE.
Tomoderus constrictus Say. 10.
Anthicus formicarius Laf. 9. 10.
Anthicus scabriceps Lec. 7.
Anthicus pubescens Laf. 8.

ELATERIDAE.
Adelocera brevicornis Lec. 7.
Adelocera obtecta Say. 6.
Limonius aeger Lec. 7.
Limonius basillaris Say. 6. 8.
Lepturoides denticornis Kby. 6. 7.
Ludius virens Schrank. 6.
Ludius resplendens Esch. 6. 7.
Ludius appressus Rand. 6.
Ludius tarsalis Melsh. 6.
Ludius spinosus Lec. 6. 7.
Ludius falsificus Lec. 6.
Ludius propola Lec. 5. 8.
Ludius nigricollis Bland. 5. 6.
Ludius triundulatus Rand. 5. 7.
Ludius medianus Germ. 7.
Ludius splendens Zieg. 7.
Ludius nigricornis Panz. 6. 7.
Ludius hieroglyphicus Say. 6. 7.
Hemicrepidius memnonius Hbst. 7.
Cryptohypnus abbreviatus Say. 5. 6.
Cryptohypnus nocturnus Esch. 5. 7.
Cryptohypnus bicolor Esch. 5. 7.
Oedostethus femoralis Lec. 6. 7.
Dolopius lateralis Esch. 6. 9.
Sericus incongruus Lec. 6.
Agriotes stabilis Lec. 6.
Agriotes fucosus Lec. 6. 7.
Agriotes pubescens Melsh. 6. 7.
Agriotes limosus Lec. 6. 7.
Betarmon bigeminatus Rand. 7.
Elater pullus Germ. 6. 7.
Elater nigricollis Hbst. 7.
Elater sellatus Dej. 7.
Elater semicinctus Rand. 7.
Elater apicatus Say. 5. 6.
Elater mixtus Hbst. 6. 7.
Elater luctuosus Lec. 6.
Elater nigricans Germ. 6. 7.
Megapenthes stigmosus Lec. 6. 8.
Melanotus castanipes Payk. 6. 7.
Melanotus corticinus Say. 6.

MELASIDAE.
Deltometopus amoenicornis Say. 7.
Microrhagus pectinatus Lec. 7.
Microrhagus triangularis Say. 8.

THROSCIDAE.
Throscus chevrolati Bonv. 5. 7.

BUPRESTIDAE.
Dicerca divaricata Say. 6. 8.
Dicerca prolongata Lec. 6. 7.
Dicerca tenebrica Kby. 6.
Dicerca chrysea Melsh. 6.
Poecilonota cyanipes Say. 8.
Buprestis maculativentris Say. 8. 9.
Anthaxia aeneogaster Cast. 6. 7.
Anthaxia quercata Fab. 7.
Chrysobothris dentipes Germ. 8.
Chrysobothris scabripennis Cast. 6. 7.
Eupristocerus cogitans Web. 7.
Agrilus anxius Gory. 6. 7.
Agrilus pensus Horn. 7.
Agrilus cephalicus Lec. 7.
Agrilus coryli Horn. 8.
Agrilus politus Say. 6. 7.
Agrilus criddlei Frost. 7.
Brachys aerosus Melsh. 6. 7.
Taphrocerus gracilis Say. 7.

HETEROCERIDAE.
Heterocerus brunneus Melsh. 4.
Heterocerus tristis Mann. 6.

HELODIDAE.
Cyphon obscurus Guer. 5. 9.
Cyphon variabilis Thunb. 4. 9.
Cyphon padi L. 7.

DERMESTIDAE.
Byturus unicolor Say. 5. 6.
Dermestes vulpinus Fab. 6.
Dermestes lardarius L. 4. 6.
Anthrenus castaneae Melsh. 7.

OSTOMIDAE.
Tenebroides corticalis Melsh. 5.
Calitys scabra Thunb. 6.
Ostoma ferruginea L. one dead.

NITIDULIDAE.
Cateretes pennatus Murr. 6.
Cateretes bipustulatus Payk. 7.
Brachypterus urticae Fab. 7.
Conotelus obscurus Er. 6. 9.
Meligethes aeneus Fab. 6.
Carpophilus brachyterus Say. 4. 8.

Carpophilus discoideus Lec. 6.
Nitidula bipunctata L. 5.
Nitidula rufipes L. 4. 8.
Omosita colon L. 4. 10.
Omosita discoideus Fab. 5.
Epuraea helvola Er. 6.
Epuraea rufa Say. 6.
Epuraea terminalis Mann. 6. 9.
Epuraea ovata Horn. 7.
Epuraea labilis Er. 5. 9.
Cyllodes biplagiatus Lec. 6.
Glischrochilus fasciatus Oliv. 4. 10.
Glischrochilus vittatus Say. 4. 9.

RHIZOPHAGIDAE.
Rhizophagus remotus Lec. 6.

CUCUJIDAE.
Silvanus planatus Germ. 5. 10.
Pediacus fuscus Er. 7.
Cucujus clavipes Fab. 5. 7.
Laemophloeus liquidus Csy. 5.

EROTYLIDAE.
Triplax thoracica Say. 6. 9.

CRYPTOPHAGIDAE.
Cryptophilus integer Heer. 8.
Loberus impressus Lec. 6. 10.
Cryptophagus actuangulus Gyll. 6.
Henoticus serratus Gyll. 5. 8.
Atomaria pumilio Csy. 5.
Anchicera ephippiata Zimm. 5. 9.
Anchicera ochracea Zimm. 4. 5.
Anchicera ovalis Csy. 4. 5.

MYCETOPHAGIDAE.
Mycetophagus flexuosus Say. 5. 6.
Mycetophagus bimaculatus Melsh. 10.
Litargus balteatus Lec. 6.

COLYDIIDAE.
Cerylon castaneum Say. 5.

LATHRIDIIDAE.
Lathridius liratus Lec. 6. 10.
Enicmus consimilis Mann. 10.
Corticaria pubescens Gyll. 5.
Corticaria elongata Tyll. 5.
Corticaria ferruginea Marsh. 5.
Melanopthalma distinguenda Com. 4. 10.
Melanophthalma gibbosa Hbst. 4. 9.
Melanophthalma cavicollis Mann. 5.

ENDOMYCHIDAE.
Endomychus biguttatus Say. 9.

PHALACRIDAE.
Phalacrus pumilio Lec. 7.
Olibrus semistriatus Lec. 7. 8.
Olibrus pallipes Say. 7. 10.
Stilbus apicalis Melsh. 7.

COCCINELLIDAE.
Hyperaspis signatus Oliv. 6. 9.
Hyperaspis undulatus Say. 7.
Microweisea misella Lec. 6.
Scymnus laurenticus Csy. 7.
Scymnus rubricauda Csy. 4. 8.
Scymnus agricola Csy. 8.
Scymnus tenebrosus Muls. 6. 9.
Scymnus nanus Lec. 5. 8.
Scymnus americanus Muls. 8.
Coccidula lepida Lec. 7.
Psyllobora viginti-maculata Say. 5. 6.
Anisosticta bitriangularis Say. 7. 8.
Hippodamia tredecim-punctata L. 7.
Hippodamia parenthesis Say. 4. 10.
Hippodamia convergens Guer. 9.
Coccinella perplexa Muls. 5. 9.
Coccinella tricuspis Kby. 9.
Coccinella transversoguttata Fald. 6. 9.
Adalia bipunctata L. 10.
Adalia frigida Schn. 7. 8.
Adalia disjuncta Rand. 7. 8.
Adalia humeralis Say. 7. 8.
Cleis hudsonica Csy. 5. 6.
Anisocalvia duodecim-maculata Gebl. 8.
Anatis quindecimpunctata Oliv. 8.
Anatis mali Say. 5. 8.
Chilocorus bivulnerus Muls. 6. 8.

ALLECULIDAE.
Hymenorus niger Melsh. 7. 8.
Hymenorus melsheimeri Csy. 6. 8.
Hymenorus pilosus Melsh. 7.
Isomira sericea Say. 7.
Isomira quadristriata Couper. 6. 8.

TENEBRIONIDAE.
Blapstinus moestus Melsh. 5.
Scaphidema aeneolum Lec. 6.
Hypophloeus parallelus Melsh. 5.
Iphthimus opacus Lec. 5. 6.
Alobates pennsylvanica DeG. 4. 7.
Upis ceramboides L. 5. 9.
Tenebrio obscurus Fab. 6.
Tenebrio molitor L. 7. 10.
Boros unicolor Say. 7. 10.
Paratenetus fuscus Le.. 5. 6.

MELANDRYIDAE.
Penthe obliquata Fab. 7.
Synstrophus repandus Horn. 7.
Xylita laevigata Hellw. 5. 7.
Scotochroa basalis Lec. 7.
Enchodes sericea Hald. 7.
Symphora flavicollis Hald. 6. 7.
Canifa pusilla Hald. 6.
Canifa pallipes Melsh. 6. 7.
Osphya varians Lec. 6. 7.

ANOBIIDAE.
Hadrobregmus linearis Lec. 7.
Xyletinus lugubris Lec. 7.
Stagetus profunda Lec. 6.
Catorama confusum Fall. 7.
Dorcatoma dresdensis Hbst. 6.

Ptilinus ruficornis Say. 7.
BOSTRICHIDAE.
Stephanopachys rugosus Oliv. 7.
SCARABAEIDAE.
Onthophagus hecate Panz. 5. 7.
Aphodius fossor L. 5.
Aphodius validus Horn. 6. 7.
Aphodius fimetarius L. 4. 5.
Aphodius ruricola Melsh. 7.
Aphodius granarius L. 6. 7.
Aphodius vittatus Say. 5. 9.
Aphodius distinctus Mull. 4. 7.
Ataenius gracilis Melsh. 6.
Geotrupes semiopacus Jek. 6. 7.
Trox capillaris Say. 5.
Serica vespertina Gyll. 5. 6.
Serica intermixta Blatch. 6. 7.
Phyllophaga anxia Lec. 5. 7.
Dichelonyx canadensis Horn. 7.
Dichelonyx subvittata Lec. 6. 7.
Trichiotinus piger Fab. 7.
Trichiotinus affinis G. & P. 6. 7.
LUCANIDAE.
Platycerus depressus Lec. 6.
CERAMBYCIDAE.
Asemum moestum Hald. 6. 7.
Criocephalus agrestis Kby. 7. 9.
Evodinus monticola Rand. 5.
Acmaeops proteus Kyb. 6. 7.
Brachyleptura canadensis Fab. 8.
Parallelina subargentata Kby. 6. 7.
Strangalepta pubera Say. 6. 7.
Leptura nigrella Say. 6.
Leptura chrysocoma Kby. 6. 7.
Leptura proxima Say. 6. 8.
Leptura mutabilis Newn. 6.
Leptura luridipennis Hald. 6.
Bellamira scalaris Say. 8.
Typocerus sparsa Lec. 9.
Physocnemum brevilineum Say. 7.
Merium proteus Kby. 7.
Phymatodes dimidiatus Kby. 7.
Xylotrechus quadrimaculatus Hald. 7.
Xylotrechus undulatus Say. 7.
Neoclytus muricatulus Kyb. 7.
Anthoboscus ruricola Oliv. 6. 7.
Psenocerus supernotatus Say. 6. 7.
Hyperplatys aspersa Say. 7. 8.
Pogonocherus penicellatus Lec. 6.
Pogonocherus salicicola Csy. 7.
Saperda calcarata Say. 7. 8.
Saperda tridentata Oliv. 6.
Saperda moesta Lec. 6.
CHRYSOMELIDAE.
Donacia subtilis Kunze. 7.
Donacia distincta Lec. 7.
Donacia flavipes Kby. 6. 7.
Orsodacne atra Ahr. 5. 7.
Syneta ferruginea Germ. 6. 7.
Zeugophora varians Cr. 6. 9.
Chlamys gibbosa Fab. 6. 8.
Pachybrachys obsoletus Suffr. 7. 8.
Monachulus saponatus Fab. 7.
Cryptocephalus notatus Fab. 6. 7.
Cryptocephalus quadrimaculatus Say. 7.
Diachus auratus Fab. 7. 9.
Diachus catarius Suffr. 7. 9.
Bassareus mammifer Newn. 6.
Bassareus sellatus Suffr. 7. 8.
Xanthonia decemnotata Say. 7.
Adoxus obscurus L. 6. 9.
Paria quadriguttata Lec. 7.
Chrysochus auratus Fab. 7. 9.
Leptinotarsa decemlineata Say. 6. 10.
Zygogramma exclamationis Fab. 6.
Calligrapha elegans Oliv. 6.
Calligrapha philadelphica L. 6. 8.
Calligrapha spireae Say. 5. 8.
Calligrapha bigsbyana Kby. 5. 9.
Gastroidea polygoni L. 6.
Lina lapponica L. 6.
Lina scripta Fab. 9.
Phytodecta pallida L. 6. 7.
Phytodecta vitellinae L. 7.
Trirhabda canadensis Kby. 9.
Galerucella sexvittata Lec. 7.
Galerucella cavicollis Lec. 6. 8.
Galerucella nymphaeae L. 6. 7.
Galerucella decora Say. 6.
Diabrotica duodecimpunctata Fab. 7. 9.
Phyllobrotica decorata Say. 7.
Œdionychis limbalis Melsh. 4. 7.
Disonycha pennsylvanica Ill. 7.
Disonycha quinquevittata Say. 5. 9.
Disonycha triangularis Say. 6.
Haltica bimarginata Say. 6. 7.
Haltica ignita Ill. 6.
Chalcoides helxines L. 4. 9.
Epitrix cucumeris Har. 6. 10.
Chaetocnema protensa Lec. 7.
Chaetocnema cribrifrons Lec. 7.
Systena hudsonias Forst. 9.
Systena frontalis Fab. 9.
Longitarsus turbatus Horn. 7.
Longitarsus alternatus Zieg. 7.
Phyllotreta vittata Fab. 4.
Phyllotreta sinuata Steph. 7.
Psylliodes punctulata Melsh. 5. 9.
Anoplitis inaequalis Web. 7. 8.
Microrhopala vittata Fab. 7.
Microrhopala xerene Newn. 7.
Chelymorpha cassidea Fab. 4. 8.
Chirida guttata Oliv. 7.
Chirida pennsylvanica Sp. 7.

Metriona bicolor Fab. 6. 9.
MYLABRIDAE.
Mylabris fraterculus Horn. 8.
PLATYSTOMIDAE.
Eusphyrus walshi Lec. 9.
Gonotropis gibbosus Lec. 7.
Allandrus bifasciatus Lec. 7.
Euparius marmoreus Oliv. 6. 9.
Brachytarsus sticticus Boh. 7.
CURCULIONIDAE.
Rhinomacer pilosus Lec. 6.
Rhynchites cyanellus Lec. 6. 7.
Attelabus rhois Boh. 6. 7.
Apion pennsylvanicum Boh. 7.
Apion centrale Fall. 7. 8.
Apion nigrum Hbst. 6. 8.
Apion puritanum Fall. 7.
Phyxelis rigidus Say. 7. 9.
Brachyrhinus ovatus L. 7. 9.
Sitona hispidulus Fab. 10.
Sitona tibialis Hbst. 4. 9.
Phytonomus nigrirostris Fab. 4. 10.
Lepyrus palustris Scop. 6. 10.
Listronotus appendiculatus Boh. 7.
Hyperodes solutus Boh. 6. 7.
Hyperodes sparsus Say. 7.
Pissodes dubius Rand. 6.
Hylobius pales Boh. 6. 8.
Hylobius confusus Kby. 6. 7.
Dorytomus parvicollis Csy. 6.
Dorytomus indifferens Csy. 6.
Dorytomus subsimilis Blatch. 6.
Dorytomus brevicollis Lec. 4. 10.
Grypidius equiseti Fab. 7.
Notaris aethiops Fab. 7.
Notaris puncticollis Lec. 10.
Proctorus armatus Lec. 5. 6.
Proctorus decipiens Lec. 6. 9.
Magdalis hispoides Lec. 7.
Magdalis alutacea Lec. 7.
Magdalis inconspicua Horn. 5. 6.
Magdalis salicis Horn. 6. 7.
Magdalis armicollis Say. 6. 8.
Tachypterellus quadrigibbus Say. 6.
Anthonomus haematopus Boh. 5. 9.
Anthonomus corvulus Lec. 5. 10.
Anthonomus musculus Say.
Anthonomus robustulus Lec. 7. 8.
Anthonomus elongatus Lec. 7.
Elleschus bipunctatus L. 5. 9.
Elleschus ephippiatus Say. 5. 6.
Orchestes ephippiatus Say. 6. 8.
Orchestes salicis L. 6. 9.
Orchestes pallicornis Say. 6. 8.
Orchestes rufipes Lec. 7.
Acalyptus carpini Herbst. 4. 9.
Piazorhinus scutellaris Say. 6. 9.
Lixus deceptus Blatch. 6.
Acallodes ventricosus Lec. 7.
Coeliodes flavicaudis Boh. 6. 7.
Ceutorhynchus rapae Gyll. 7. 8.
Ceutorhynchus sulcipennis Lec. 7.
Ceutorhynchus decipiens Lec. 6. 9.
Rhinoncus pyrrhopus Boh. 7. 8.
Conotrachelus nenuphar Hbst. 6.
Cryptorhynchus bisignatus Say. 6. 7.
Dryophthorus americanus Bedel. 10.
Cossonus impressifrons Boh. dead.
Sphenophorus pertinax Oliv. 7.
Sphenophorus robustus Horn. 5. 7.
SCOLYTIDAE.
Scolytus piceae Sw. 8.
Polygraphus rufipennis Kby. 6.
Dendroctonus simplex Lec. 6.
Dendroctonus valens Lec. 6. 8.
Hylurgops pinifex Fitch. 5. 8.
Hylastes porculus Er. 6.
Trypodendron rufitarsis Kby. 7.
Gnathotrichus materiarius Fitch. 6.
Ips perturbatus Eich. 5. 6.
Ips pini Say. 5. 6.
Orthotomicus caelatus Eich. 5. 7.
Orthotomicus vicinus Lec. 6. 8.
Dryocoetes americanus Hopk. 6. 8.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

WEATHER

(*Continued from page 117*)

ALTHOUGH efforts were made to compile meterological records, conditions were such that the mass of notes and observations made were not up to the standard required by the Meteorological Office. Temperatures for the main part were merely recorded to the nearest degree, and wind directions only to the points of the compass. This is somewhat regrettable as hitherto no one had had the opportunity of making winter observations in the treeless country of the interior distant from the moderating influence of the sea.

The minimum temperature at the extreme east end of Great Slave Lake on January 28th, 1925, was 64° below zero, the altitude being 480 feet.

On the same day the temperature at our tent on Casba Lake at an altitude of 1210 feet was probably well down into the seventies, if not lower. We were travelling at this time, and in my diary I record the cold as excessive, for on the 29th and 30th we were forced to lie up.

Extreme low temperatures are not, however, in themselves exacting, on account of the relative dryness of the atmosphere, the worst feature is the fact that almost invariably heavy winds accompany them. I do not mean to imply that low temperatures bring wind, but the region is, during winter, so windswept that even on the coldest days strong winds will occur and they contribute more than anything to personal discomfort.

The coldest winds are those from between the north and north-west. Next coldest are those that blow from the north-west and west-north-west. Those from towards the east are usually warmer.

During September 1924 the prevailing winds were south-west and north-west. The month was exceedingly rough with fifteen days of gales. The first snow fell on the 19th, the 20th bringing a considerable precipitation.

During October north and north-easterly winds were the rule, nine days bringing heavy gales in the early part of the month. Artillery Lake was frozen over on the 25th, and most of Casba River by the 27th.

The first thirteen days of November brought strong south-westerly winds, the latter part of the month being given to winds that came from the east and east-south-east. The minimum temperature for the night of 14th-15th was 28° below zero. The weather during the latter part of the month was unsettled, snowy, and stormy.

December commenced well with a falling temperature, 52° below zero being registered on the 15th. Between that time and the 21st, however, the temperature steadily rose until on that date zero was registered. With the rise in temperature came the heaviest gale of the year, and a blizzard continued to blow for seven days in all its fury. Prevailing winds north and north-west.

January was cold and during the first days of the month the swift water at the constrictions of Casba River froze over. Generally speaking, however, it was a fine month, with but two bad storms. Winds northerly and variable between east and west.

February was cold and rough with a seven day blizzard commencing on the 12th. There were many fine clear days, but not a day passed without a strong wind. Prevailing winds west of north.

March was rough again, blizzards blowing for fifteen days, the worst from the 10th to the 16th, although another almost as bad prevailed from the 27th to the 30th. On the 20th, however, drops of blood frozen on a caribou hide were melting when exposed to the sun in a sheltered position. At our base near the site of old Fort Reliance the maximum temperature recorded on the 24th was 26°, although on the 9th 43° below zero was registered. The prevailing winds were from the north-west.

April was an exceedingly fine month with many south-easterly winds blowing. There was, however, a bad three days' gale during the 27th, 28th, and 29th. On the 22nd the temperature rose as high as 42°, but on Artillery Lake at 2 a.m. on the 27th it dropped to 2.5° below zero again. First rain fell on the 30th.

May started badly and continued so until the 22nd, the end of the month, however, being exceptionally fine. The thermometer hovered around thirty and forty, and whereas at night there was very little freezing it was not until the end of the month that heavy thawing set in. The latter part of May should not be depended on to give good snow travelling conditions. The majority of the days in May were essentially Spring-like and clear, the bad weather referred to was merely the occurrence of heavy ground winds, the prevailing direction of which were, to commence with south-south-east, later changing to east, north-east, and north-north-east.

In June we had the first calm days, but even so there was always a sort of draught; indeed there was no day during the entire year that a silk handkerchief hung in the wind would not flutter. On the night of the 5th the first heavy rain fell, the storm continuing for two and a half days. Wet cloudy weather occurred during eighteen of the days of May. Winds east-south-east, and west-north-west. It continued to freeze at night until the 26th.

July came in well and continued a fine month except for occasional rain storms and a few heavy winds. The temperature rapidly rose with the disappearance of snow and ice, and by the 25th it was most oppressive in the open rocky country. As we were travelling at this time along Thelon River and had not the energy to climb out of the valley to determine the true direction of the wind I do not consider my notes worth giving.

August was a stormy month, and it was remarkable for the fact that during a morning, possibly, the wind would make as many as four distinct changes in direction and velocity. For the day to commence with a south-westerly or a

north-westerly wind invariably meant that bad weather was to follow later. The first frost occurred on the 14th.

September saw us arrive at Chesterfield Inlet where there is a meteorological station, further remarks therefore are unnecessary.

My notes on weather filled twenty-two pages of foolscap, and, indeed, the subject is practically inexhaustible. Hardly a day passed that did not bring with it peculiar weather conditions well worth noting, but although much of the information would be invaluable to future travellers or residents in the country, they do not seem desirable here. However, there are one or two points that ought to be given.

As stated elsewhere in this report, gales in the treeless country of the interior invariably, I think I may say, last either three or six and seven days especially during winter. They occur very regularly from October to February at about seven or ten day intervals. There are exceptions to this rule, but the rule should generally be accepted and remembered by those contemplating lengthy dashes with a minimum of provisions and fuel. The southerly winds should be regarded suspiciously as they generally precede blizzards by a day or two.

A seven day blizzard generally quietens for the matter of an hour or so during the third day. This does not mean that there will be a calm during that period, but the wind may be expected to decrease in velocity by about twenty miles an hour. Advantage should be taken of such a momentary lull to evacuate a disagreeable position or to avoid a critical situation, and any man unfortunately placed would do well to keep awake during the twenty-four hours of the third day in expectation of that lull.

Inland, away from large bodies of water, such as the sea, there is little mist. Mists do occur however as late as November and as they are thick and not unlikely to last three days, they are not to be trusted by those to whom the country is new.

In spring, summer, and fall a haze is often met with that very much resembles smoke. The color is identical and the manner in which it hangs and drifts in the air is very similar. This phenomenon presages rain either by one or three days.

During the summer heavy dews fall and every care should be taken to cover perishable material.

TRAPPING

I have yet to meet the man who will deny that trapping fur with steel traps is other than a cruel practice. The further north we go the more obvious the inhumanity of the practice becomes.

In the woods and in those latitudes where winter weather is less persistently exacting, the trapper is enabled to visit his line with some regularity. He does not necessarily find this incumbent because of an inborn desire to reduce the cruelty entailed by his occupation to a minimum, but because trapped animals are ever likely to damage their hides struggling in the snare, or are subject to the raids of predatory animals. He, moreover, is anxious to visit his traps at frequent intervals just as the financier watches the tape machine; considering profits, contemplating the future, and making quick returns. The trap that is holding an animal cannot catch another until that animal is removed. Close attention to the line is all-important also because settings become frozen and drifted up with snow.

In the woods the trapper chooses his line, blazes it; and on the average covers a twenty-mile stretch three times a week. Animals are rarely left to linger more than two days before being put out of their misery.

On the coast, however, in the treeless country, and at the edge of the forest different conditions prevail. Blizzards are common occurrences, snow is constantly drifting, and generally travelling is distinctly unpleasant, and where igloos are impossible to build for want of snow it is not infrequently a hazardous undertaking.

The average trapper who pushes outward to the timber's edge is not equipped for climatic conditions as are the expeditions that are generally associated with undertakings in the wilder and unexplored districts. He is short-handed, certain days of the week are wholly occupied with necessary camp chores, hunting for his dogs, and the number of bad days that render work on the line impossible, bring the percentage of days, whereon the line goes unattended, remarkably high.

I am chiefly concerned with white fox trapping in this report, and it is this branch of the profession that requires attention.

White foxes are the easiest of the fur bearers to trap. Put the trap down with sufficient bait, and, provided the animals are in the region, the foxes will be caught.

The method employed varies, but according only as whether the trapper is a white man or a native.

The Indian realizes that the fox is migratory, or rather that it follows the migrations of those animals that provide it with food. As soon as the caribou come in from the north the Indians make a point of making a large killing, because they know that if the caribou move off again the foxes will surely follow them where they go unless the carcasses of deer are left lying about for them to feed on. Before the foxes are prime these carcasses are cached in the rocks or elsewhere, but as soon as the season opens up they are used as bait and traps set around them. The killing may have been made several miles away from winter headquarters and it may not be visited more than three or four times during the year.

After a while a band of caribou is met with in some other direction. All is excitement, rifles are unlashed, and the sport commences. If the Indians are fortunate the whole band is wiped out. Each sleigh takes home a leg or so, the tongue and a few other choice parts and the remainder of the kill has traps set about it. All go cheerfully home, after, possibly making a poor attempt at caching a few ribs.

A period of want may ensue and a trip to the scene of the slaughter may have to be made. Should this be the case what foxes have been caught in the meantime will be picked up and brought in. If the catch has not been as large as was expected, perhaps the traps also will be pulled up and brought away. The remainder of the meat will stay there of course . . . . in any case it helps to attract fur.

Some days later another killing will be made. The same will happen again, a little meat brought in, and traps set around the carcasses.

If it is a good caribou year several more slaughterings will ensue closer to home, the outlying traps will be forgotten except when household troubles or hunting days turn the men out in that direction.

No organized system is ever observed by Indian trappers, and traps may be left unattended for months.

The Eskimo traps in a different manner about those Posts that I visited. Fish is invariably used, rotten fish in small baits. Apparently they are content to catch the foxes as they pass through or have not learned that large baits will serve to keep fur in the vicinity after the migration has passed. The difficulty no doubt lies in the fact that large baits are not easily procured in a country to which the caribou no longer penetrate in large numbers, although they must have heard that the carcass of a whale left on the shore is the scene usually of the best trapping possible. However, the Eskimo are not such an improvident people and they are most careful to preserve for their own uses nearly everything but that which is absolute refuse, at any rate they take care to place it *en cache* in case misfortune should accrue in the future even though it may never actually be used.

The white trapper has not yet penetrated the interior treeless country, though there are a few that live at the edge of the forest and trap a short distance into the treeless zone. Bringing with them white man's food apportioned to last them throughout the winter, and not being imbued with the same zest for slaughter they are not forever on the trail killing and caching meat for the "rainy day", as the Indian may be said to do.

Their mode of existence is more orderly and consequently their system of trapping comes under the same heading.

During the fall the surrounding country is "looked over", a suitable line is chosen, not longer than ten miles without an intermediate shack. Just before the streams freeze up the traps are put in selected places, a little trench being cut in the ground for the toggle and frozen there with water. Hummocks at points of lakes or along the bends of streams are the best places, and they are selected with a view to their not being subsequently drifted up. The traps are then marked with a willow stick (they remember them on Hudson Bay!) and left until the season opens.

Where there is good fishing a considerable quantity of fish will be put up during the summer, but for use principally as dog food. In the interior it would appear as though the foxes are much better attracted by caribou flesh, although along the coast (of Hudson Bay at least) little else but fish is used. White trappers usually have some strong smelling paste or fluid with which they scent the trap. In some cases it is useful, but by far the best method is to sprinkle the setting with fox urine, or bury under it part of the reproductive organs of one of the animals.

Wherever a caribou is shot and gutted is an excellent place to set a few traps; they like to nibble the fat off the intestines, and a frozen "gut-pile" will receive the attention of foxes for a week and more. But whereas the Indian would set his traps right on the spot where the caribou was shot, the white man will drag the deer to some place on his line and eviscerate the animal there.

Although white trappers are in the habit of killing caribou for fox bait, it is difficult to adopt a censorial attitude towards the practise. I saw a good deal of trapping about Artillery Lake,

but never an instance of an entire carcass being left out for bait by white men. Invariably they will take away the hams, shoulders, tenderloin, brisket, and neck, leaving little more than the skeleton for bait.

The only successful method employed for setting the trap is to use a snow crust. A long knife is carried with an eight to twelve inch blade. A thin block of snow of the right consistency is cut and thinned down to a thickness of about half an inch. This is placed over the jaws of the trap, the trap having been sunk into a shallow hole in the snow slightly larger than the jaw-spread. The crust is placed in position and a little loose snow and frozen blood sprinkled over it.

When an animal of sufficient weight treads on it the crust is broken, the pan depressed and the jaws close. Until recently the ordinary plain-jawed trap has been used, usually Numbers 2 and 1½ for foxes. Now, however, it has been found that the No. 2½ otter trap with teeth is more satisfactory. The latter is a much heavier trap, seems to have a larger jaw spread and has the advantage of being an excellent wolf trap as well. Moreover it is found that in exceedingly cold weather a plain, rather sharp-edged pair of jaws is apt to bite through fur and flesh and allow the animal to escape. The white fox is a fierce, and hardy little animal and will fight until the last. They will "worry" the trap until (if they be in good condition) the leg bone breaks, until the bone pierces the flesh in many places all round the limb above the trap, and until constant twisting and turning parts all the tissue but the stronger tendons. A fox must usually be in a trap for about two and a half days before this occurs. If when he was trapped his condition was such that his reserve of fat could keep him alive over this period, it is possible that a drop in temperature will freeze those remaining tendons, then if the strength still remains in the animal a sudden jerk may free him. I have seen four foxes escape in this manner, and it is quite a common occurrence with Arctic Hares when caught by the fore leg. Their hind legs are so powerful that they will often tear the tissue high up in the shoulder, when a mass of blood will be found under the hide all over it.

The trap with teeth rarely allows an animal to escape. In the first instance it seems invariably to catch the fox higher up the limb, preventing excessive movement, the teeth pierce the flesh and before the leg becomes frozen probably there is a considerable loss of blood which weakens the animal. The trap is heavier and this prevents the fox from running about with it and fighting with the fierceness that tears the flesh.

As soon as a fox is trapped he will commence rushing in every direction. After a while he commences to scratch; he does this at the end of the length of chain, always keeping the chain taut. The result is, that about the point on which he pivots, which is that end of the chain attached to the toggle and frozen into the earth, a large mound of snow is piled; over and about this the animal urinates and drops blood, this with the constant padding of his feet freezes and packs it. As the mound grows higher the chain grows shorter, until the wretched beast is left perched on a pinacle three feet high and as pointed as a sugar cone. Only the trap remains above the snow, and the swing of it on its swivel is the limit of his movement, the trap and the top of the mound becomes a mass of blood and snow and so hanging by the mangled limb, head downwards he lies to die of exhaustion or cold.

It is a slow death and an agonizing death. It is also unnecessary.

There are Indians and Eskimo that never (comparatively speaking) recover a fox alive, and they may catch a hundred in a season.

One or two people have asked me whether the steel trap is cruel. In writing, at any rate in a report of this nature, it is impossible to render graphically the very torment that the word trapping implies. The attitude with which the practice is regarded is essentially hypocritical. It is positively ludicrous when we read about the methods and punishments adopted in civilized life to prevent cruelty to animals, supremely ridiculous when we see persons deeply incensed by the sight of a lame horse being driven about the streets, particularly when one observes that those very persons themselves are wearing a coat made of the hides of many animals that have suffered the tortures of the damned

It would be foolish to censure the practice unless some alternative method of conducting the industry were offered. Fur will always be in demand, and moreover the revenue derived from the industry is of great importance to Canada.

Two methods of relieving the situation of much of its unpleasantness might be adopted. Either or both. Poison and an impetus given to fox farming.

Taking poison first. I think if Bruno Lorringer, the Government wolf poisoner, could be induced to describe his observations unreservedly, we might learn that by far the most satisfactory manner of catching fur is by the use of strychnine. He could tell us candidly that no animal, even the wary raven included, is able to detect its

presence if the meat into which it has been introduced has not been so handled by human beings, or implements smelling of then, as to rouse the suspicions of the ever alert wild animal. Possibly the fact would become known that quite a number of individuals escape but to die some distance from the bait, but I think this could be reduced to a minimum in fox poisoning, to such a degree in fact that losses due to this might be rendered inconsiderable. Little or no danger need be the portion of the trapper using strychnine. Foxes would be picked up free of the covering of blood and filth which snaring causes and every advantage could be taken of using the remains of caribou for bait, much trouble and time would be saved were cumbersome traps dispensed with, caribou would never suffer from being caught in traps as they often are, a greater percentage of wolves would be killed, as seems desirable, and finally much of the cruelty attending present methods would automatically disappear. A few convulsions and all would be over.

The indiscriminate use of poison, however, must not be tolerated until white fox farms are permanently and successfully established. Poison might be distributed to applicants by authorized druggists in certain quantities. It might be made up in phials, each phial containing sufficient strychnine to make one poison bait. The poison could be distributed in varying quantities to trappers, according to the districts in which they intend operating. Or, instead of this, whenever a district showed signs of becoming depleted of fur a ban could be put on trapping in that district until such time as the animals had again increased. This would obviate the trouble that might arise from jealousy on account of an uneven distribution of poison. Difficulties of course would be experienced in keeping smuggling down to a minimum, but this matter could be controlled by making the offence punishable by a term of imprisonment.

With the increase in number of white fox farms the necessity for strict vigilance in this matter would become less. It is held that the partial extermination of the wolf is necessary if the caribou are to be safe-guarded, hence if the fox breeding industry is firmly established the campaign against wolves could be conducted without the possibility arising of the valuable white foxes being lost to the country and the market. Wolf poisoning cannot be undertaken without there being a danger of these foxes being wiped out.

I have heard it claimed that whereas a wolf will take a poisoned bait, a white fox will not. With me I had a bottle of Burroughs & Welcome's Iron and Arsenic Compound, in tabloid form and non-sugar-coated. A few of these tablets I powdered up, and with the powder "poisoned" a couple of baits. This particular compound contains strychnine, arsenic, quinine sulphate and iron. Now, although it would appear as though the foxes, that attacked the bait, spat out those parts of it tainted by the powder, they could not nevertheless discriminate between the good and the bad until it had been tasted. No wolves happened to pass by these baits, but several foxes did, and most of them had a feed I never found any sign of a fox being harmed by my experiment, but I felt satisfied in assuming that on the average ten foxes to every wolf would be the harvest yielded by poison.

In the spring of 1925 I passed through the camp of the wolf poisoners, who at that time had moved up to one of our shacks on Artillery Lake. They had been there about two weeks, and although they told me that they had killed no wolves there up till that time, it was evident from the number of white fox carcasses lying about that my theory was more or less correct.

NOTE.—It is strongly recommended that the season for white fox trapping be changed. White foxes trapped between November 15th and December 15th, are not, in the southern portion of their habitat, as valuable as those trapped in April, and along the edge of the forest, at least, much waste would be averted were the open season made a month later, *i.e.* from December 15th to May 1st*. Trappers would undoubtedly benefit from such a change, although it is difficult to conceive that they would be content to sit in their cabins doing nothing during November and December. It would possibly have a beneficial effect, in that men knowing that so much time is ahead of them, might feel more inclined to penetrate further into the interior, and into unexplored country, a fact which, if large fur returns are viewed with favour by the Government, and if the discovery of mineral is held as the only factor governing the opening up and development of the country, seems desirable.

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* The writer seems to disregard the ill effects of killing the animals during the breeding season. I have seen ten embryos taken from a female fox in April. Many Arctic coast trappers quit trapping voluntarily at end of March because the fur begins to get loose at that time. April foxes may look well but show loose hair abundantly—R.M.A.

(To be continued)

BUMBLEBEE OCCUPYING ORIOLE NEST

By ARTHUR GIBSON, Dominion Entomologist, Ottawa, Canada

IN January last I received from Mr. Arthur R. Athey, of Canton, Ont., an old nest of the Baltimore Oriole which had been appropriated by the common bumblebee, *Bremus fervidus* (Fabr.). The nest was found, about 16 feet from the ground, in an elm tree. With its contents it was forwarded to Dr. T. H. Frison, of Urbana, Ill., an authority on wild bees and their nests. In reporting upon this unusual nesting site, Dr. Frison stated:

"I have carefully searched the comb for remnants of bees which might lead to the determination of the insect originally making the comb. I am glad that I have found sufficient material to make a positive identification of the species involved. Since you request some information which might be adapted for use in one of your Canadian publications I include a few remarks pertinent to the subject.

The finding of colonies of bumblebees in the nest of birds and other queer places has been the subject of frequent anthropomorphic outbursts both in America and Europe. When we analyse the requirements of a good nesting site from the point of view of a bumblebee queen, the utilization of a bird's nest for a colony site presents no factors differing from the common use of a mouse nest for the same purpose. Any place which affords protection from sunlight, rain, etc., and provides soft materials which can be used to cover the comb, is a potential site for a bumblebee colony. There is no difference to certain species of bumblebees between a good nesting site in a hanging oriole's nest and a mouse nest in a discarded shoe in a pasture. The difference is purely due to the human point of view. Bumblebees do exhibit certain preferences regarding their nesting sites but these differences deal with such ecological factors as a preference for woodlands versus the prairies, terrestrial strata versus subterranean strata, etc.

The remnants of six workers and two males were found in the nest debris. All the workers and one of the males belonged to the species *Bremus fervidus* (Fabr.). The other male is a specimen of *Bremus impatiens* (Cress.). Both of these bumblebees are common throughout southern Ontario, and one of them—*fervidus*—has a distribution from British Columbia to Nova Scotia. An examination of the contents of eight cocoons containing fully developed bees further proves that this comb was produced by a colony of *Bremus fervidus*.

The presence of a male of *Bremus impatiens* in the upper part of the comb is explained as simply a case of a male entering the nest of another species. This frequently happens and the same species (*impatiens*) has been found in the hive of the common honeybee. No doubt these visiting males, which are not bound by home ties like the females, are attracted to the nests of other species by their odour. Although I have published records to the effect that queens of certain species of bumblebees will upon occasion invade the recently established nests of other species, kill the queens originally starting the nests, and produce mixed colonies, such was not the case in the present instance.

A count of the empty and full cocoons in this nest reveals that this colony produced approximately one hundred and fifty bumblebees; a medium-sized colony for this species of bumblebee. No traces of inquilines or social parasites were found in the nest debris."

Apparently few definite records are available in North America regarding the use by bumblebees of old nests of birds for the purpose of establishing colonies.

Dr. L. O. Howard (1918)[1] records a colony of *Bremus americanorum* (=*pennsylvanicus*) in Missouri which was found in an abandoned nest of the English sparrow in a tall elm tree. Dr. Frison (in litt., Feb'y, 1930) has given me the following additional notes.

"Hoffer (1882)[2] states that most nests of birds under certain conditions are occasionally occupied by colonies of bumblebees. Hoffer's observations applied to the European species. Rau (1922)[3] records a nest of *americanorum* in a wren's nest made in an old paint bucket. Prerovsky (1899)[4] records a nest of bumblebees in an old dove or crow nest in a pine tree. I now have in press, an article dealing with the bionomics of *americanorum* which will record a nest of this species found by myself in a Red-headed Woodpecker's nest in an old tree. Under controlled conditions I have managed to get bumblebee queens to start their colonies in old bird nests."

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[1] Howard, L. O.—An Unusual Bumblebees' Nest (Hym.). *Ent. News*, Vol. XXIX No. 3, March, 1918, pp. 114–115.

[2] Hoffer, E.—Die Hummeln Steiermarks. Lebensgeschichte und Beschreibung Derselben. Erste Hälfte. Einunddreissigster Jahresbericht der Steiermärkischen Landes—Oberrealschule in Graz. 1881–1882. (2 pls.) pp. 1–92. Graz, 1882.

[3] Rau, Phil.—Notes on Captive colonies and Homing of *Bombus pennsylvanicus* DeGreer. Annals of the Ent. Soc. America, Vol. XVII, No. 4, pp. 368–380 with 1 plate. December, 1924.

[4] Prerovsky, Dr. Richard—Auffallendes Vorkommen series Hummelnestes. Illustrierte Zeitschrift für Entomologie. Bd. IV, p. 123. 1899.

BIRD-LIFE CHANGES IN TWENTY-FIVE YEARS IN SOUTHWESTERN SASKATCHEWAN

By LAWRENCE E. POTTER

THE district referred to in this article lies south of the Cypress Hills in the extreme southwest corner of Saskatchewan. The writer came to this point in the valley of the Frenchman river in 1901. At that date, of course, such large game as the buffalo and elk had been exterminated several years; the prong-horn antelope was still fairly plentiful. Regarding the bird-life, however, probably little if any change had taken place. Settlement was sparse and that only in the valleys and creek bottoms, the land was untouched by the plough and covered with grass, while the many sloughs and streams gave harbour to wild fowl in scarcely diminished numbers. It was certainly an almost virgin country for the ornithologist. With the exception of Macoun, who passed this way on his journey west in 1895, no naturalist, I believe, had ever visited this section. The country north of the Cypress Hills described by A. C. Bent (Birds of South-West Saskatchewan, *Auk* XXIV 1907, p. 407) differs in many respects.

With certain exceptions this paper is a somewhat melancholy and monotonous repetition of steady diminution in the numbers of many of our finest and most interesting species. As has been the case all over North America, wild fowl of all kinds have decreased considerably. In the river bottom this is most notably in the case of the American Merganser, which used to breed here freely. However, at the present time, an attempt is being made to establish trout in these streams, so perhaps, too many "fish-ducks" would not be desirable. Other species, such as Mallard and Pintail, are still numerous, but appear to fight shy of the valley, preferring the open sloughs. The Canada Goose formerly nested here in limited numbers. The last time the writer saw a pair with downy young on the river was in 1912.

During the years that beaver were plentiful, that is, from about 1908–1918, the American Bittern became very common, evidently finding the shallow water areas caused by the beaver dams suitable to its habits. But beaver were almost wiped out later and have never regained their former numbers: and the bittern has likewise decreased and is now rather rare. The Blue Heron has increased and is now a familiar bird; of late years a new heronry has become established about 15 miles upstream. On account of its fish-eating propensities this bird is also regarded with suspicion today.

If ever the Whooping Crane occurred here it was before my time.

Twenty-five years ago the Longbilled Curlew swarmed everywhere; today it has become a rarity in the valley, but a few may yet be seen on the prairie. Other large shore-birds such as Marbled Godwit, Willet, and Bartramian Sandpiper, are less common, especially the latter. The Golden and Black-bellied Plovers I have never known here.

The Hungarian Partridge extended its range from the west to this neighbourhood about 1924 and I saw my first pair on May 21st of the following year. By 1926 the partridge had become plentiful, but since then its numbers seem to have fallen again. This apparent decrease is possibly due to the last two summers, 1927 and 1928, having been more than usually wet, and is probably only a temporary setback. The Ruffed Grouse is a bird of general distribution across the continent and it is a curious fact that the Cypress Hills is the only considerable wooded area in Canada in which this species is not indigenous. In the spring of 1922 a number of these grouse were liberated in the district by the Game Department, some of them within 10 miles of here; but that any of their descendants survive today seems unlikely. I have been informed now and again of the Pinnated Grouse occurring here, but it is still scarce; I have never seen it except on one occasion, and that was while motoring in south-east Alberta in 1925.

It is truly regrettable to note the ever-growing scarcity of the Sharp-tailed Grouse; whether the close season recently imposed will be of any assistance in saving this very excellent bird may be doubted. Several observers remarked to me last fall how few prairie chicken they had seen in places where not so long ago the chicken were plentiful. The loss is the greater because the sharp-tail is one of our few birds that habitually frequent the farm-yard in winter time. Even more regrettable is the disappearance of the Sage Grouse. In the old days there were two "dancing-grounds" close by and the young birds used to become very tame and confiding. They would "dust-bath" close by the buildings, and invading the vegetable garden pluck out the hearts of the lettuce and other green plants. We would gladly grow lettuce to feed sage-chicks today! As it is, the most we see is an odd bird or two in winter, and during the last two winters not even that.

The Mourning Dove has increased very noticeably in the last ten years.

Now that grain farming has largely displaced cattle ranching the Turkey Vulture, once plentiful, is now uncommon. Of the larger hawks, our most prominent species is the Swainson hawk. At one time this valuable bird seemed to be threatened, but in recent years it has nearly regained its former abundance. Unfortunately, the same cannot be said of its larger relative, the Ferruginous Roughleg. Never as common as the Swainson, yet ten or a dozen of this fine hawk's nests might have been easily found in a day's walk; last year in the same time and area I was rewarded by finding one nest. The Golden Eagle is not uncommon in an average winter, and while a pair or two probably nested here in former times, I do not think that any do so now. Two other disappearing birds-of-prey are the Prairie Falcon and Richardson's Merlin. Formerly the immature prairie falcon in October was our most troublesome poultry robber; a bad habit that has probably been the bird's undoing. The Merlin used commonly to nest in the vicinity; in the past four or five years I have failed to find a nest.

On July 13th, 1912, I saw a Black-billed Cuckoo for the first time. The cuckoo was undoubtedly attracted to this neighbourhood, which is about the extreme western limit of its range in southern Saskatchewan, by the abundance of the tent caterpillar. As the latter increased in succeeding years, so did the cuckoo, until 1923, when the characteristic notes could be heard in every thicket. On July 5th of that year I was shown a cuckoo that had been killed by a cat. It proved to be a brooding female, with breast bare of feathers and a fully developed egg in the oviduct. Since 1924 the caterpillar pest has abated and we have seen no more cuckoos.

The Horned Lark, which used to be invariably the earliest spring migrant, now winters with us, in limited numbers. Apparently our only variety at all times of the year is the Desert Horned Lark (*O. a. leucolaema*), but a series of winter skins might prove to contain a proportion of northern forms, such as *hoyti*.

During 1901–1904, the first three years of my time here, the Magpie was fairly common. Then for the next six years it vanished altogether. A. C. Bent in his list does not include the Magpie, though he mentions finding one deserted nest. In the fall of 1910 a few Magpies appeared again and since then they have multiplied to the extent of becoming a serious pest; and have, moreover, extended their range north and west into central Alberta, where previously they were unknown. When visiting Red Deer in October, 1919, I was informed that the Magpie was then penetrating into that country; the Magpie is also cited as a newcomer in Taverner's Birds of the Red Deer (*Auk* XXXVI 1919, p. 1). The Raven was never common here, and I have recorded only about two or three individuals, the last in 1912. As usual, the Raven has retired before settlement, whereas the Crow has increased until lately, when its numbers have been reduced by systematic persecution.

This type of country is scarcely suited to the Bobolink, which is only occasionally noted, but the bird is said to be spreading over the west in irrigation districts, and for some years about five or six pairs nested in a hay meadow at a neighbouring ranch.

One of the first arrivals every spring is the Tree Sparrow and it stays as late in the fall as possible. During the winter of 1924–25 half a dozen tree sparrows wintered at a farm in this valley, and this present winter there have been a few in the town of Eastend, five miles further down the river. The Western Meadowlark and the Red-winged Blackbird occasionally contrive to winter here, given sufficient shelter and feed in the shape of waste grain. It is safe to say that none of these three species would have wintered in Saskatchewan before the days of settlement.

The first House Sparrow appeared on this ranch on October 6th, 1907.

For some reason, in the last four or five years the Barn Swallow has become very scarce. At one time there would be three or four pairs nesting in our outbuildings; but since 1923 this very welcome bird has never appeared. Other observers have noted the same falling off. In 1927 I saw just one pair of barn swallows, which were nesting in a culvert upon a high road; in 1928 none at all. The Cliff Swallow has also decreased, but the Bank Swallow is as plentiful as ever.

In 1922 a pair of Eastern Bluebirds nested near by. This was my first acquaintance with the species in Saskatchewan. Since then nearly every year occasional bluebirds have been noted and last summer (1928) a pair again nested here in a telegraph pole. The eastern bluebird is said to have reached Manitoba about 1883. There is no mention of its presence in Saskatchewan in Macoun's *Catalogue of Canadian Birds*, published in 1909; and yet the bluebird reached this end of the province in 1922. It would be interesting to know whether by this time it has been seen in Alberta, only 40 miles away. The Mountain Bluebird was presumably always here;

nevertheless, it has gained in numbers perceptibly in my own experience.

From further enquiries during this summer (1929) it is gratifying to learn that the Ruffed Grouse is spreading out into the Hills from the Forest Reserve; also in the south slope a few birds have been observed near Ravenscrag, Sask

NOTES AND OBSERVATIONS

GARTER SNAKES AS FISHERMEN.—While carrying on palaeontological field work, in southern Saskatchewan, last summer (1929) I was much surprised at the abundance of Garter Snakes (*Thamnophis ordinoides vagrans*) especially in the neighborhood of some of the shallow, alkaline lakes.

While working along the northern shore of the eastern half of Twelve Mile lake, on a very hot day in July, I was surprised to see the beach almost covered with these Garter Snakes. A rough count showed fifty snakes in a distance of one hundred yards and on most sections of the shore they seemed equally numerous. Twelve Mile lake is very shallow and in many places the water is not more than a foot in depth for a distance of fifty yards from shore. In this shallow water were countless thousands of minnows from about one to three inches in length. The Garter Snakes seemed to be fond of fish for they all appeared to be fishing and all followed the same method of securing their dinner but, of course, the smaller snakes took smaller fish. A snake would swim out into the lake, where the fish were numerous, dive down, swim under water, and catch a fish. The fish was caught by the middle and immediately lifted out of the water. The snake would then swim to shore with the fore part of the body erect and the jaws, which held the fish, from three to six inches above the water. After reaching the dry, rocky, beach the snake would drop the fish, turn it to suit and swallow it. They made sure that they were well away from the water before letting the minnow down.

In the April, 1918, issue of this magazine, J. M. Macoun reported the catching of a small trout by a Garter Snake, in Kingsmere lake, near Ottawa, and no doubt many others have observed such performances but the fishing was being done on such a large scale in Twelve Mile lake that it seems worthy of recording. I have often observed the Garter Snake frequenting quiet, shallow water where small fish have congregated, in the edge of the Red Deer river in Alberta.

It is quite likely that small fish make up a considerable part of the Garter Snake's diet, especially in certain sections of western Canada, where toads and frogs are very scarce.—C. M. STERNBERG.

ACTIVITIES OF THE EUROPEAN HARE.—Port Credit, Ont., 11th March, 1930. Until this year the European Hare was very uncommon in this locality, but this winter increased numbers have done extensive damage in two or three young orchards.

Two weeks ago on a walk along the bank of the Credit River I found that nearly all low bushes had been pruned off at about 15 inches from the ground; twigs up to the size of a pencil being cleanly cut.

Low branches and small trees had been cut in many cases and some were girdled.

Oak, apple, hawthorne, poison ivy, butternut, hemlock, grape and sumach had all been attacked.

In the case of fallen apple trees nearly all the bark had been cleaned off. Sumach seemed to be the next favourite, and poison ivy was well trimmed. I found in the flats that very few willows had been touched.—R. DELAMERE BLACK, JR.

Pomoxis annularis IN ONTARIO.—On June 26th, 1929, I took a specimen of the white Crappie (*Pomoxis annularis* Rafinesque) in the Grand river, at Dunnville, Ontario, which is about eight miles from Lake Erie. I believe that this species has been authentically recorded only once previously from Ontario waters, viz., from Burlington bay, Lake Ontario. (The fishes of the Canadian waters of Lake Ontario, by J. R. Dymond, J. L. Hart and A. L. Pritchard, Univ. Toronto Studies, Biol. Ser. No. 33, Pub. Ont. Fish. Res. Lab. No. 37, 1929).—R. F. CAIN.

UNUSUAL NESTING SITES.—While engaged in field work members of the Museum Staff have observed several instances of unusual nesting sites that might be worthy of record. I am at a loss to explain the departure from recognized habits, but in some cases, at least, there is a suggestion that an abundant food supply might have been instrumental in diverting the birds from their usual habitations, to areas where conditions necessary for their normal nesting requirements were lacking. In other cases this theory would not apply, for normal conditions were available, and some other motive must be attributed for the change. Possibly, a greater measure of safety was sought but it is doubtful if the object was

achieved. At any rate, not so far as their enemy, man, is concerned, for the new situation in nearly all cases observed was more easily found than would have been the case had the nests been built in customary places.

Normally, the American Crow, as is well known, builds in trees its bulky nest of sticks, weeds, and other coarse materials. In many treeless sections of the prairie, such as Big Quill Lake, crows have been found nesting on the cross-arms of telephone poles. In such cases one usually finds nearby a marsh well-stocked with ducks, coots, rails, grebes, and other marsh-loving birds. Probably the easy available food supply is the principal factor for the crow locating in such areas.

A similar attraction was no doubt the reason for a crow building its nest in a rose bush almost on the ground on The Last Mountain Bird Sanctuary.

The most unique nesting site of the crow encountered was one found on the top of a chimney of a country church, between the towns of Pense and Lumsden. One Sunday afternoon, about five years ago, while waiting outside the church for a friend who was attending service, we were attracted by a crow making repeated trips between the field and the chimney. Upon closer inspection we could see plainly the sticks of the top portion of the nest protruding above the chimney, and once or twice we saw the heads of the young birds as one of the parents returned to the nest with food. Last summer while driving by the church with a friend I related the incident to him. Scarcely had I finished the story when, passing an abandoned farm house, two miles south on the same road, we noticed a pair of crows that seemed to have a fascination for the old building. The foregoing incident no doubt prompted us to stop the car and look over the situation, and we were surprised to find, upon investigation, that these crows had also nested in the chimney. It is interesting to speculate as to whether these were the same birds, or any of the progeny of those, first seen. It is worthy of note, in both these cases, there were plenty of suitable trees nearby that the crows might have chosen for their nests.

Only on one occasion have I found the Mallard nesting in trees, but this habit is apparently of frequent occurrence as evidenced by the number of reports received from time to time relating to similar incidents. I have also in my possession a photograph of a Canada Goose nesting in a tree, presumably about twenty feet high. The person from whom I received this photograph informs me that it was taken in Alberta. The old, disused nests of crows, or hawks, were usually chosen by these waterfowl.

In Saskatchewan we mostly find the Great Blue Heron and the Double-crested Cormorant nesting on the ground or on rocks on small islands, but in the Moose Mountain Game Preserve, there is a small island where both these birds nest in the same trees. The smaller nests of the Cormorants were about fifteen feet from the ground, while those of the heron were much higher and near the top of the trees. It was interesting to observe that several Bronzed Grackles occupied the Herons' nests, making their homes in the openings of the nest near the base. Mountain Bluebirds have also been noticed occupying homes that were part of the nest of the Ferruginous Rough-legged Hawk.

The Flicker, for the most part, in treeless areas of Saskatchewan, makes its home in telephone poles and fence posts. This year a nest and eggs were found in a hole in the banks of the Frenchman River near Val Marie, reminding one of the habits of the Bank Swallow and the Kingfisher.

The open bars of the iron platform of the fire escape at the Normal School, Regina, was the choice of the Mourning Dove for its scanty nest. While the least disturbance would have wrecked the nest and sent the two white eggs to the ground twenty feet below, no such fate happened and the young were successfully reared.

No doubt other observers could add considerably to the foregoing list of unusual nesting sites and it occurs to me that it might be of interest to have such observations noted.—F. BRADSHAW.

THE HOUSE WREN IN NEW BRUNSWICK.—The house wren is quite a rare bird in New Brunswick. It is not included in either of the old lists of the birds of this province and in Mr. Wm. H. Moore's list it is simply noted as "Rare, seen in Fredericton". It seems reasonable to suppose that the species may have been seen in other parts of New Brunswick but with the exception of one bird seen in Fredericton nearly twenty years ago, I know of no record until one visited our premises in 1923. This being so perhaps it would be worth while recording my acquaintance with the species.

On the 24th of May, 1923, I was planting seed in my garden when I noticed feathers and straws dropping around me. On looking to see where they were coming from I saw that a small brownish backed bird was dropping them out of a bird house that was almost over my head. On getting a good look at the bird it did not take much

thinking to decide that it must be a house wren. After working industriously for a while, it flew to a nearby plum tree and bubbled over in song, so I knew it was a male.

He stayed around for nearly a month emptying the bird houses of rubbish and then filling them up again, always busy and singing as if someone pressed a button. He tormented a pair of tree swallows in one bird house nearly to death. He would dodge into their apartment every time he had a chance but they couldn't scare him. He didn't seem to have any mate for he was around the bird houses every day and always alone for I watched him carefully.

The next spring, 1924, what I supposed to be the same bird, came back the last week in May. He was just as industrious, just as meddlesome and just as musical but he did not stay quite as long and again he seemed to be alone. Then for four years I did not see a wren.

Last spring on May 27th, 1929, another male wren arrived and on the 10th of June I have written in my note book "House wren still here" but I am not positive just how much longer he stayed. Why a lone male bird should come to this province where his kind are so scarce when he could go where he could find a mate and be fruitful and multiply is beyond me. Perhaps there must be pioneers. There doesn't seem to be any adequate reason why house wrens shouldn't come here, as well as fly catchers, vireos or others of our insectiverous birds. We certainly have enough insects to feed them.—SUSAN K. SQUIRES, Fredericton.

ANNUAL REPORT.—McIlwraith Ornithological Club, 1929: During the year seven regular meetings were held, one in the London Life Auditorium with an attendance of 300, being addressed by Dr. R. M. Anderson of Ottawa. Of the other meetings four were addressed by Mr. W. E. Saunders and one each by Mr. J. H. Cameron and Mr. E. M. S. Dale, from our own club. The average attendance at these meetings was 48.

On January 11th a banquet was held in the Hotel London in honor of Mr. W. E. Saunders. This was attended by 60 including Dr. H. G. Arnott representing the Hamilton Bird Protection Society, and Mr. Jack Miner, of Kingsville, while other sister societies sent messages of congratulation which were very much appreciated.

On June 1st a picnic was held at "Wannacotte" while on September 21st our meeting took the form of a corn roast and bonfire on the grounds of the Queen Alexandra Sanatorium.

Four Saturday afternoons in April and May were given over to organized bird walks in charge of some of our field men, and excluding the first week when it rained heavily, were enjoyed by an average of 21 persons. The annual morning bird hike for the Normal School students took place at Saunders Pond, May 17th, while on December 28th we conducted our twentieth Christmas Bird Census listing a total of 39 species, as already recorded in the pages of *The Canadian Field-Naturalist*

During the year, 191 species of birds were observed, some of the rarest being, Black Tern, Gadwall, Wood Duck, Whistling Swan, Dowitcher (second record for the county), Golden Eagle, Canada Jay (first record), White-rumped Sandpiper (first record), Evening Grosbeak, Pine Grosbeak, Lapland Longspur and Carolina Wren. —N. M. NORTH, Secy.

BOOK REVIEW

PROVISIONAL LIST OF LAND MAMMALS OF THE STATE OF WASHINGTON, *by Walter P. Taylor, Senior Biologist, Bureau of Biological Survey, United States Department of Agriculture, and William T. Shaw, formerly Professor of Zoology and Curator of the Museum, State College of Washington. Occasional Papers of the Charles R. Conner Museum, No. 2, December, 1929. The State College of Washington, Pullman, Washington. pp. 1–32.*

The authors, well known to our readers as the writers of a previous joint work, "The Mammals and Birds of Mount Rainier National Park" reviewed in these columns, (42:180–2, Oct., 1928), have just produced another paper recording the occurrence of 175 species or subspecies of land mammals in the State of Washington, belonging to 65 genera, 24 families, and 7 orders, giving their distribution in the State and important locality records, particularly of the rarer forms. It is based primarily on species and notes acquired by the Bureau of Biological Survey and co-operating institutions, notably the State College of Washington. A summary is given of the work which has been done on mammals of the State, beginning with Biological Survey work in 1889. A list is given of the number of specimens of Washington mammals in various institutions and private collections, the largest number being 6,821 in the Biological Survey collection at Washington, D.C., and the second 700 in the State College of Washington. The Museum of

Zoology, University of Michigan, follows with 573 specimens, and the Field Museum of Natural History, Chicago, with 520 specimens. More than ten thousand specimens of Washington mammals are reported in the collections listed, not including an unknown number in the U.S. National Museum.

The range of some of the species might well be extended in some instances. For example, the first species in the list, Townsend Mole, *Scapanus townsendii*, is listed "West side, north to Rockport, ..." but is now known to range north to the British Columbia boundary, specimens having been collected for the National Museum of Canada in 1927 by C. H. Young and H. M. Laing just north of the International Boundary at Huntingdon, B.C. Seven species of the shrews listed, including *Sorex trowbridgii* and *Sorex bendirii*, also range north into parts of British Columbia. Eighteen species of bats are listed, and as only part of these have been recorded in British Columbia, the attention of our Western collectors may be very profitably directed to this group with every probability of adding to the Canadian list. The California Badger, *Taxidea taxus neglecta* ranges into several of the interior dry valleys of British Columbia and it would be well if more were known of its distribution and economic status before this rather helpless species is wiped out completely by excessive trapping due directly to the recent phenomenal price put on its head by the fur trade. We should also like to know more of the habits and occurrence of the four species of lynxes or wildcats which are listed from Washington, at least three of which occur locally in British Columbia.

Many detailed records are given of many different forms of chipmunks, pocket gophers, mice, and voles, which come close to the Canadian border. There records should be carefully checked up by British Columbia collectors, as many of the smaller mammals are not found unless they are looked for, and these notes give many clues as to what species may be expected to stray over the line. We note with approval that the authors have placed the Agassiz Meadow Mouse as a subspecies, *Microtus oregoni serpens* Merriam, but do not agree with their placing *Microtus drummondii* (Audubon and Bachman) as a full species, preferring to follow Hollister (*Canadian Alpine Journal*, 1913) and Bailey (N.A. Fauna, No. 49, 1926) in considering it a subspecies of *Microtus pennsylvanicus*. It is recorded from only the extreme northwestern part of Washington, but occurs commonly north and northwesterly in British Columbia. The various records of big game are of great interest, particularly as many species are on the decline and are apt to take a sudden plunge into extinction. The so called "Coastal White-tailed Deer," *Odocoileus virginianus leucurus* (Douglas), is said to be extinct in Washington, and we regret to state that its status is very uncertain in southern British Columbia, although a few individuals are believed to be still alive. The Washington Bighorn Sheep, *Ovis canadensis california* Douglas is said to have formerly occurred north to the Canadian boundary, but it is now nearly extirpated in the State except for reports of irregular occurrence in the Mount Chopaka and Mount Bonaparte region. This seems to be the same subspecies as the Okanagan, Lillooet, and Similkameen sheep of southern interior British Columbia. It would be very desirable for naturalists who are in a position to do so to gather historical and scientific data on the last two forms and put as much information as possible on record before it is too late. The list on the whole is full of information on distribution of species and provocative of many questions, which we hope will be stimulating and valuable to naturalists on both sides of the International Boundary.—R. M. ANDERSON.

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Meetings are held each Monday evening, except on holidays from October to April, in the physics theatre of the University, Winnipeg. Field excursions are held each Saturday afternoon during May, June and September, and on public holidays during July and August.

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VOL. XLIV OTTAWA, CANADA, OCTOBER, 1930 No. 7

NOTES ON THE OCCURRENCE OF VARIOUS ANIMALS ON THE FISHING GROUNDS ON THE COAST OF BRITISH COLUMBIA

By H. C. WILLIAMSON, D.Sc.
Pacific Biological Station, Nanaimo, B.C.

WHILE the writer has been engaged during the past few years in various fishing investigations on the west coast of Vancouver Island and northward, a number of interesting animals have come under observation and it seems worth while to place on record some of the occurrences.

FISHES

In 1925 a porbeagle shark, *Lamna cornubica* Gmelin, was taken on the spoon at Hippa Island. A blue shark, probably *Prionace glauca* (Linn.) is somewhat frequently caught by trollers along the coast. Dogfishes, *Squalus sucklii* (Girard) are very commonly caught on the spoon and at times are very troublesome to the fishermen. In May, 1928, they were especially numerous on the South Bank off Barkley Sound and were so eager that the salmon had little chance of taking the spoon. Thus one man caught in one day twenty-eight dogfish and but one salmon.

Sting-rays, *Dasyatis* sp., have been caught at Kyuquot, some of them "snagged" but one was hooked in the mouth. An electric skate, *Tetronarce* sp., as taken there in July, 1928. The troller was fishing "light" which indicates that the fish had been well up off the bottom.

A number of sunfish, *Mola mola* (L.), (Fig. 1), were observed in 1926 and a specimen of Ray's bream, *Brama raii* (Bloch), (Fig. 2), was taken on a spoon.

FIG. 1—The Sun Fish, *Mola mola*

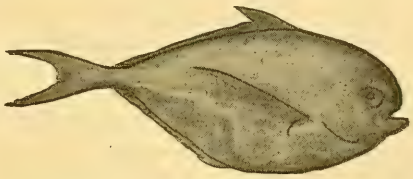

FIG. 2—Ray's Bream, *Brama raii*

SALPS

Salps occur sometimes in great abundance and they cause trouble to the fisherman through becoming impaled on the hook and thus preventing the spoon from working properly. They often float some distance below the surface and their presence is revealed by their fouling the spoons. One fisherman said they were in a sunk zone, one to two fathoms thick, and that the level at which they were swimming altered during the day. When he found the salps on his hooks he was able to avoid the zone by altering the length of his lines. Many of the salps floating on the surface were partially torn and were often covered more or less by air-bells. The probability is that some of the damaged specimens had been bitten by diving seabirds, and had, in their torn condition, risen to the surface. McIntosh has described how gulls peck at the salp on the surface and remove the "nucleus". Some of the salps observed here at the surface were minus the "nucleus".

In June, 1925, large individual salps 3 inches long, probably *Salpa fusiformis* var. *aspera*, (Fig. 3), were observed off Barkley Sound. They were common off Hippa Island in July of the same year. Little salps also occur in chains, of varying thicknesses, some being less than one-quarter of an inch broad. The broadest chain observed was three-quarters of an inch wide.

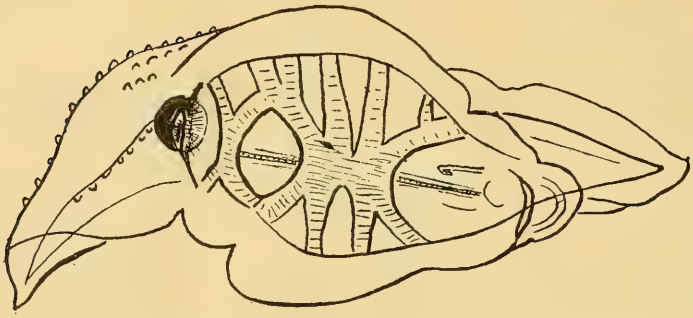

FIG. 3—Salp, *Salpa fusiformis* var. *aspera*. (Natural size)

The salps are united side by side in a ribbon or chain which may be 3 feet or more in length and which may be seen floating a foot or so below the surface. They have a slow, undulating movement, and break up rapidly.

In 1926, salp chains were first observed on May 1st, in Ucluelet Arm, Barkley Sound. During that month great quantities were seen in the Arm, in Ugly Channel and in the South Bank. Lancefish were observed hovering near, as if intent on attacking the salps. Solitary salps were observed on the Big Bank, and on one occasion a salp 1½ inches long was brought up on the fishing line although none was noted at the surface at the time. Some solitary salps 1½ inches long were seen off Amphitrite Point in June. It was recorded on June 21st that no salps had been seen for some time.

In the summer of 1927 the big, solitary salps, accompanied by chains three-quarters of an inch in breadth were abundant off the coast of Vancouver Island and gave the fishermen much trouble during July. Mr. H. E. Neave, Kyuquot, designed an attachment to the hook to prevent the salp becoming impaled. (Fig. 4). A piece of clock spring one-eighth of an inch broad was attached by one end to the shank of the hook. The other end of the spring pressed against the point of the hook. Two fishermen tried the improved hook and got more fish on it than on the ordinary hook. At that time, however, fish were scarce and it happened just at the close of the season, so that an extended trial of the hook was not possible. It was evident that the attachment of the spring to the hook did not interfere with its catching properly.

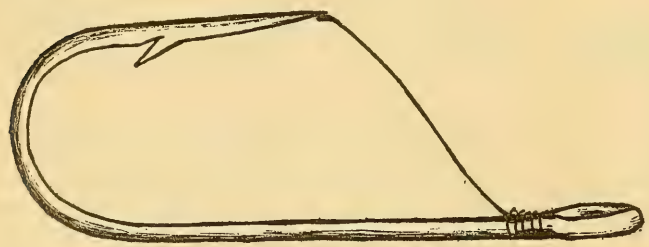

FIG. 4—Wire spring attached to hook to prevent salps becoming impaled.

On September 22nd, 1928, the writer observed a large quantity of small salps, seemingly dead, or moribund, at the surface, five miles off Ou-ou-Kinsp Inlet. They were principally solitary salps, but one chain was noticed.

JELLYFISH

Medusæ, such as *Aequorea*, *Cyanea*, *Sarsia*, etc., and Ctenophores occur in quantity at times. A specimen of *Cydippe* was found in the stomach of a chum salmon.

During August, 1928, some material in the water clogged the trolling lines and spoons. Strings became attached to the spoons, interrupting the wiggling movement. When the line was hauled the material came off, accumulating in a mass in the hand. This occurred for about ten days off Barkley Sound and it appeared also off Estevan about the same period, or a little later. Very few spring salmon and hardly a coho was captured during this time. Whether the salmon were absent or whether that was due merely to the spoons not working properly, one could not tell. A sample of the material was obtained and Mr. G. H. Wailes, who examined it, reported that it resembled the fine tentacles of a jellyfish. When fresh the mass was of a reddish-brown colour. It was found on the line 4 or 5 fathoms down and it occurred, it was said, down to at least 15 fathoms, the deeper the more abundant.

In July, 1929, attention was drawn to the fact that something in the sea was causing the hooks and wires to rust very quickly. It

occurred where the spoons were worked close to the surface, between Ship Island and Satellite Pass. Deeper down than 5 fathoms the action did not occur. There were large numbers of big, brown jellyfish in the water and these fouled the lines. It was suspected that some fluid from the jellyfish caused the pitting of the hooks, which could be detected after a few hours in the sea.

VELELLA

Velella, (Fig. 5), popularly known as Portuguese-Man-o'-War, was extremely abundant during the summer of 1926 off Barkley Sound, and according to other observers it occurred in extraordinary numbers from Cape Mendocino north to Hecate Strait. The first specimens observed by the tagging staff were secured by Mr. Baxter

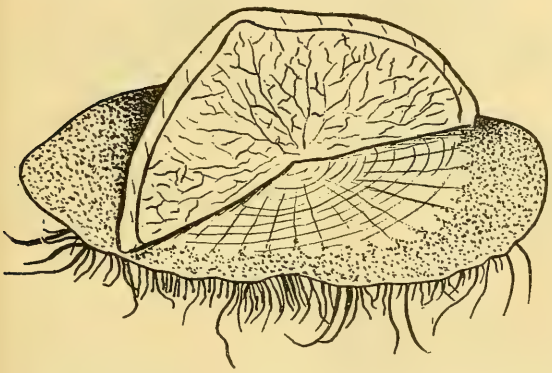

FIG. 5—Velella, commonly called on the Pacific Coast, Portuguese-Man-o'-War.

on May 11. Thereafter they were seen continuously up to the middle of August all over the fishing grounds. In some cases the velellæ were so closely packed together on the surface that they formed a green patch, visible from a considerable distance. They were touching each other so that no water was visible between them. The largest velella observed was three and three-eighths inches long. The broad margin of the raft is of a deep blue colour while the sail and center of the raft are colourless. The sail is set obliquely on the raft and the velella sails along in front of the wind when the sea is smooth. No instance came under observation of a velella being impaled on the hook, so that it seems probable that they are restricted to the surface. The velellae drifted into Ucluelet Arm and they were thrown up on the beaches on the outside of the Ucluelet peninsula, dead in enormous quantities. The dried skeletons persisted in the beach for some time after the fleshy part had decayed. On August 16th only a few velellae, and these were dead, were observed on the S.W. Bank. On August 28th and September 1st no velellæ were seen at Amphitrite Point. Velellae have been seen before at Ucluelet but apparently many years previously.

In several of the velellæ, food was found consisting of a lancefish one and one-quarter of an inch long, a flat-fish eleven-sixteenths of an inch long, a large megalops and a zoea. Spring salmon, cohoes and sunfish were found to have eaten the velellae.

In 1927, velellae were reported on the South Bank in March. They were smaller than those of 1926: some were not more than three-quarters of an inch in length. No later report of them was received in 1927.

In 1928 the writer observed velellae on a number of occasions. Some were seen in Walter's Cove, Kyuquot, on May 1st. They were very small, about one-half to three-quarters of an inch in length. On May 10th large numbers were reported ten miles south of Amphitrite Point. They had been observed also off Cape Cook and were recorded as mostly small. On May 30th, several small velellae and great numbers of *Cydippe* were seen 30 miles south-west of Amphitrite Point, and on June 4th great quantities of full-sized velellae were observed from 25 to 33 miles south of Cape Beale. There was a big concentration of velellae one mile off Cape Beale on the same date. Between these offshore and inshore points, few were noticed. The fact that so many small velellae were observed in 1928 would seem to point to the velella having reproduced its species at some place not very far off the coast of British Columbia. In 1929, as late as August, no report had been received of velellae occurring off the West coast.

BARNACLES

The floating barnacle, *Lepas fascicularis* Ellis and Solander, (Fig. 6), has been observed on the West Coast between Quatsino and Cape Cook by Captain Laird, F.P.S. *Malaspina*, and in Queen Charlotte Sound by Captain Henderson, F.P.S. *Givenchy*. Mr. I. E. Cornwall, who identified it, quoted Darwin as describing the float as a singular development of the cement tissue which ordinarily serves to attach the barnacles by their bases to some extraneous object, but here, surrounding that object and the peduncle, gives buoyancy by its vascular structure to the whole. Attached to the larger barnacles were some specimens of the small barnacle, *Lepas anatifera* L. Two very small barnacles were found attached to the under side of a velella in July of 1926. Mr. Cornwall states that they appear to be the

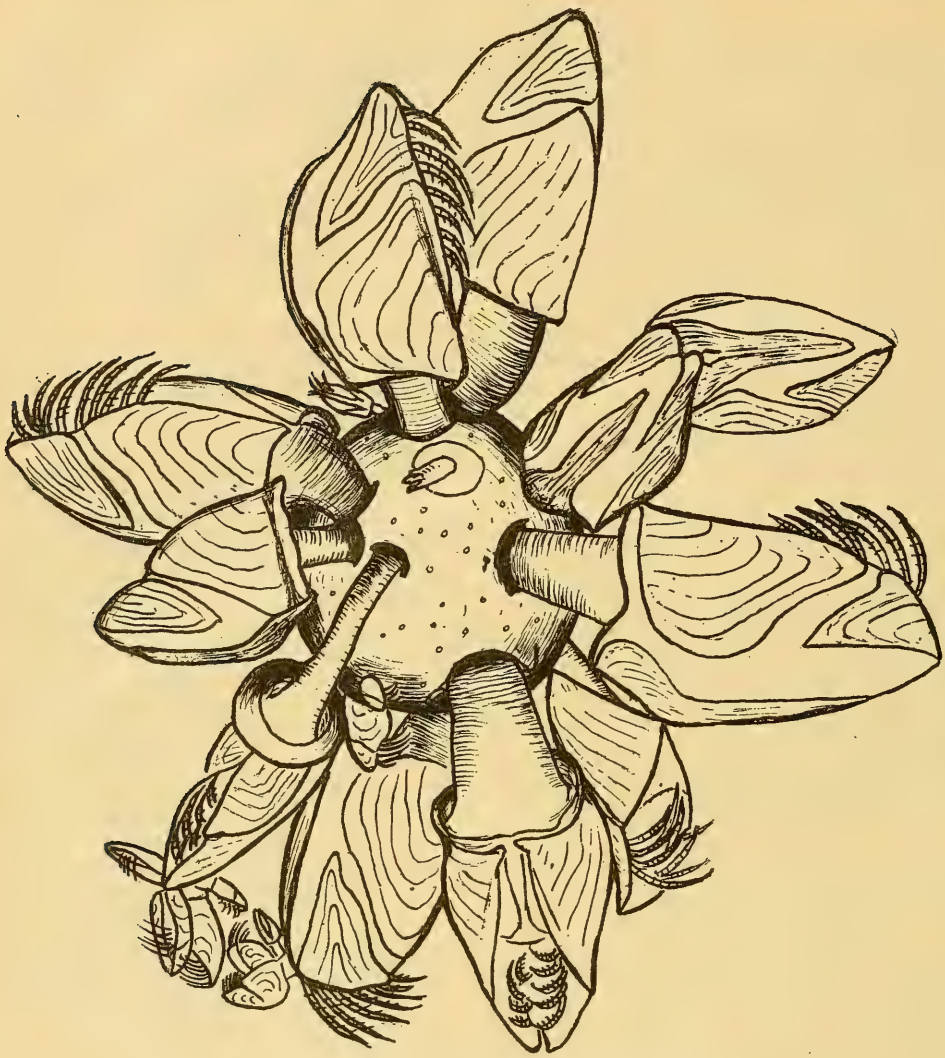

FIG. 6—The floating barnacle, *Lepas fascicularis*

young of *Lepas fascicularis*, which Darwin records as occurring on this host.

AN ISOPOD

A large Isopod parasite, *Cirolana*, was frequently observed on the spring salmon, and occurred also on the ling cod.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

(*Continued from Page 145*)

DURING our residence north of the timber we had every opportunity to observe habits of the Barren Lands wolves (*Canis occidentalis tundrarum*). We lived amongst them and but few days passed consecutively without some sign of them being seen.

The wolf is a noted animal and more data concerning him will be found by turning to the biological section of this report. From time immemorial his presence and often his name has been

heralded by dread. Numberless stories have been written describing his ferocity, sagacity, and fearlessness, all of them supposed to be based on fact, but most of them nevertheless audacious and quite ridiculous fabrications. Only in the story of Romulus and Remus do we find any lenity expressed, and there of course the other extreme is touched, though the exaggeration is hardly greater than that displayed by certain writers when treating of his viciousness.

I have studied the wolf in his natural habitat, both when he has been fat, and when he has been starving, but my conclusion is that nowhere in the north country would I feel dismayed on his account at being forced to travel unarmed. Time and time again have I been followed into camp by wolves in varying numbers, and with varying degrees of appetite, but although some wolves do make an attempt to preserve their dignity when they know that they have been observed by man, the vast majority beat a hurried and ignominious retreat.

John Hornby, who because of his nineteen years in wolf country and his propensity for travelling in unorthodox ways, usually alone, knew empirically the barren land wolf better probably than any living white man, stated that except for an occasional alarm, on no occasion has the behaviour of one or many wolves caused him to distrust the security of his position as a lone traveller of the north country. The most startling incident of his experience occurred north of Great Bear Lake. He was sleeping out alone on the tundra, when he was awakened by an unearthly noise. He started up to find a wolf with its muzzle within three inches of his face, the wolf that had howled. No doubt the immediate effect proved somewhat disconcerting, but it is none the less true that the animal, on recognizing that the creature he had come upon was nothing less than his instinctive enemy, man, turned tail and fled with precipitation. Around his house on Great Bear Lake he records that wolves were exceedingly numerous and venturesome about fifteen years ago, and that after dark they would come round, howling and sniffing at the caches and garbage heaps. But only on one occasion has he heard of an authentic instance of a man being killed by a wolf. That was somewhere north on the Mackenzie River many years ago, and that man happened to be badly crippled.

The only other instances of wolves killing human beings that I know to be perfectly true, have been in the instance of an occasional Indian or Eskimo child who had become waylaid during a blizzard and had fallen down. We hear that Eskimo children have been carried off by wolves. I have no reason to doubt this, but we may safely assume that the child had wandered some distance away from camp, fallen down, become demoralized and offered too dainty a morsel for a hungry wolf to pass by. Wolves are not the only animals that will attack human beings in the north. Only just recently was there the shocking case of Mrs. Clay of Chesterfield Inlet, who lost her life after being terribly mauled by sleigh dogs at the trading post. But here again we learn that the poor woman fell down before the dogs set on her. For months she had known these animals, had made pets of them, and on this occasion was actually playing with them. Indian children have often been killed by sleigh dogs, but there is no evidence to show that they have been attacked while standing on their feet.

I will not digress so far as to discuss the situation in Siberia and Russia. Most of the thrilling stories read of in fiction originate there, and tales are told of wolves travelling in enormous packs and attacking whole communities. I can but feel that gross exaggeration has its part here as well.

The largest pack I have ever seen consisted of five wolves. Hornby, I believe, saw them travelling in packs up to nine, but never in larger numbers.

On one occasion I was travelling with dogs southwards on Artillery Lake. With me was a man who was continually reporting the presence of huge packs of wolves. It was in April and we had just left his camp in the early morning. As we passed on to the ice from the timber he suddenly halted me, bade me hide behind the sleigh whilst he pointed out one of his famous wolf packs. They were about a thousand yards away, and about twenty travelling rapidly together. Being somewhat intrigued I got out my glasses and handed them to him. He took a glance, then removed them from his eyes, rubbed his nose and then the lenses and had another look. "By God" he said, "they've got horns", meaning of course they were caribou. I took back the glasses and we said nothing more about it.

Before continuing, however, it seems advisable to quote a passage from J. W. Tyrrell's "Across the Sub-Arctics of Canada". It was at nightfall on 12th August, 1893, that, ". . . after a long day's struggle with the opposing elements, as we were hauling the canoes ashore towards the shelter of some rocky cliffs, we were suddenly set upon by a pack of huge grey wolves. A great, gaunt, hungry looking brute with dilated eyeballs led the attack. He was the largest wolf in the pack and a daring brute; but for once, at least, he met his master, as he was promptly

bored from end to end with a slug from my brother's rifle. The leader of the pack having been thus despatched, the others fled, but avenged themselves by howling at us all night from the surrounding hills."

According to the testimonies of my associates it would appear that *Canis occidentalis tundrarum* does not travel in larger bands than eight or nine. Hence it would seem reasonable to assume that the packs seen north of the timber are formed by parent wolves and their own litters.

During the winter of 1924-25 I was walking over a trap line that extended southwestwards to the northern extremity of Artillery Lake, and coming to the top of a hill I saw that in the last setting there were several moving forms. I was still at a distance of over a mile, and forgetful for the moment of the tricks the northern light played, took for granted that the entrapped animals were, in spite of the fact that they appeared rather dark in colour, white foxes showing up without their usual bright whiteness, by reason of the fact that they were between me and the setting sun. I walked onwards into an intervening valley, but on ascending the next ridge summit, saw to my surprise that they were indeed wolves. Two had been caught alongside one another, the two traps having been set with but a yard separating them. Both these wolves were frantically hustling one another in their efforts to escape. The third wolf was caught at a distance of about ten yards. I immediately killed the three and examined them. All three were males, of the same age, apparently twenty months old, and evidently of the same litter. Unfortunately I was unable to take their measurements because I skinned two on the spot, and the third froze into such a contorted position that when it was skinned, still in a semi-frozen condition, we considered it not worth while.

Wolves were most numerous during the first two days of April, they passed in bands of three or four individuals at such frequent intervals that I crossed no less than eleven sets of tracks in nine miles. They were moving in a north-westerly direction.

I have failed to solve the problem of this movement. Apparently they were moving in advance of the caribou migration, for the caribou did not move past us in large numbers until towards the middle of the same month.

Throughout the remainder of the year there was evidence of their presence in our vicinity almost every day. Notes on our observations may be read by turning to the biological section.

The barren-land wolf apparently breeds during the first two weeks of June, and the place usually chosen for a den is one of the many glacia leskers or some other place where there is loose drift material in which to dig a tunnel and hole. Here the pups are born, the site usually being chosen near some deer-cross where there should be reasonable opportunities for the old animals to obtain the required amount of meat. The pups are suckled for about two months and are then fed either on chosen pieces of meat or the partially digested contents of the mother's stomach disgorged for that purpose. At two years old they are practically full grown. The young animals then follow their parents until they themselves take mates.

The wolf apparently prefers to frequent the district in which he was born, and although necessity may take him abroad for considerable distances, he will often return to the old home. Although this is difficult to prove, careful investigation has given us to believe that such is the case. Nevertheless there must be a number of exceptions. For instance if two wolves from different localities mate, and if, as is supposed to be the case not infrequently, they pair off for periods of several years, then both of them cannot very well return repeatedly to familiar surroundings about the old den. Even so it is not improbable that the country about both of the dens should be visited, and the more attractive of the two chosen.

Favourable breeding places are not found everywhere in the Northern Plains, and there are huge areas where wolves may be said never to have their young. The most desirable site is that which combines good hunting and the suitable soil for digging into. Hence there must be districts in which wolves breed in comparatively large numbers. However, we believe that these animals would not favour crowded conditions, as this would entail all the worst features of competitive hunting arising at that time of the year when the parent animals have not themselves alone to feed.

From what I have been able to gather, both from my own observations and by listening to the reports of the natives of the country, wolves are not likely to be found breeding in any given locality in greater numbers than about one pair to four square miles. A certain Indian I met informed us that he had taken wolves in seven wolf dens from the esker on which we spent the winter, from a stretch about ten miles long. He did not find signs of wolves breeding in numbers anywhere along the route we travelled, but a series of old dens showed us that in country which, though suitable for den burrowing, was not well stocked with game the year round, the interval

between dens was usually about twelve miles. No doubt, however, there are known instances of two or more dens being found in use within a much more confined area.

In certain localities I believe the wolves to be more uniformly numerous than in others, not solely because of better hunting, but also because of suitable breeding grounds. Where these two factors combine, such as in those places where the caribou are to be found both in summer and winter, no doubt the slaughter is heavy. Where we were, however, although the caribou were numerous the whole of the winter we found practically no signs of wolves having killed off more than an occasional deer. Wolves, as has been remarked already, were with us the year round as well.

It is useless to try and persuade sophisticated persons to believe that the wolf lives to a large extent on small rodents. He may in summer to some extent, but in winter he must be almost entirely dependent on big game. I do propose, however, attempting to prove that the wolf's influence in the north country is not wholly harmful.

The Barren Land wolf is dependent for a livelihood on meat, even though I have found evidence to show that herbs are eaten when times are hard. It is the same with the fox. But the wolf has a larger body to clothe and feed, and only the most nutritious food in winter will keep him in that condition which will provide the coat and fat to resist the cold, and the energy and speed to run down the fleet caribou in the clogging, tiring snow. Some say that wolves are given to fighting amongst themselves and feeding off the carcasses of the fallen ones. I am doubtful about this even though I have known wolves to devour their own kind when, skinned, they have been left lying about the trap line.

During January, 1925, I killed and skinned out a wolf, leaving the carcass on the trap line. For three weeks it remained there untouched, no animal passing within a considerable distance. At the end of this time, however, a wounded wolf commenced to frequent our camp, causing a good deal of trouble by eating up all Hornby's trapping baits. After a while it seemed that something scared him, possibly a trap he sprung gave him a painful nip on the foot, at any rate he kept away from caribou meat. One day we walked to the place where the wolf carcass had been lying, but found that it had been dragged away some distance, and that a great part of it had been eaten. We watched for a few days and eventually it was all eaten. I think this is unusual for the Barren Land wolf, why I know not, except that this was the only wolf carcass of many left lying about that was eaten by another of its own kind. In the timber I believe matters are different, and the Government wolf poisoners have told me that it was not uncommon to find a wolf eaten by another. In all cases these animals had not been touched, however, until dead, and I know of no instance where a deliberate attack has been made on one by another in order to stave off hunger.

I have much belief in what John Hornby says, that a starved wolf is like any other starved animal, too enervated to engage willingly in deadly combat. Invariably his experience has been that brute force under such conditions gives way to added cunning. Had a wolf the strength to hunt I feel that he would not face another of his kind equally ferocious and as determined as all wild creatures are to defend themselves from their enemies to the last of their strength.

The depredations on the stockman's ranges do not yet have to be considered by us in this report. The remarks that I have to make with respect to their attacks on the wild game may, however, be considered applicable to the reindeer farming industry which we expect to see practised in this region before many years have passed.

The Barren Land caribou range the northern plains in numbers that can only be spoken of in millions. Their number has as yet been only very approximately assessed, some have suggested five millions, others forty millions. In fact no one knows to within millions how many caribou there are in northern Canada. The best way to arrive at some idea of their numerical strength is to consider the northern plains in much the same manner as we do the prairies, and to allot to each animal a certain area, and to divide that grazing area into the whole. It is not a matter to be discussed here however.

The question of the number of wolves is even more difficult to consider, and can only be spoken of in the abstract. During recent years a scare seems to have arisen suggesting that the caribou in the north are in danger of extermination by wolves owing to an increase in the number of wolves, or owing to a diminution in the number of caribou caused by the promiscuous use of fire arms by all and sundry. We are, however, inclined to believe that a point of balance is reached by reason of the fact that not only do caribou suffer at the hands of the modern hunter, but also the wolves.

The government has placed a price on the wolf's head, and a high price too, and every year the amounts paid out in bounty testify to the fact that large numbers of wolves are destroyed, wolves that not only live in the timber but those

also that penetrate the treeless regions during the summer and live among the caribou. The incentive that is given by this bounty of $30 per pelt causes in our opinion a sufficient destruction of wolves to compensate for the added number of caribou that are yearly falling before the rifles of hunters. In other words by the introduction of the bounty, and the wolf hunting which receives an impetus by reason of its introduction, the balance of nature is maintained, and actually the caribou are in no danger of extermination by wolves as yet.

Without any doubt at all great inroads are made by wolves into the caribou herds annually. For instance, assuming that there are four million caribou ranging Canada, and fifty thousand wolves; and holding that every wolf on the average will kill one caribou per week we find that the annual destruction of caribou by wolves is over two and a half million. Almost incredible, but not an unreasonable assumption. A wolf must have a caribou a week, because the foxes must be taken into consideration, animals that will smell a wolf kill possibly miles away, and gorge themselves on it just as soon as the wolf's back is turned. If a pack of five wolves kill caribou it will last them no longer than for one day, indeed they might take no more than one feed off the carcass, and once left it is reasonably certain that to return the next day would, in fox country and it is all fox country, be to find but the bones left.

But the caribou is a remarkably fecund animal, and moreover the cows are more numerous than the bulls. Again the cow invariably breeds the year following its birth, and we believe we have evidence that calves have been dropped at the age of one year. Rarely are dry cows come across, and during the migration in the summer, when thousands upon thousands passed us, we saw no matured female animal that was not accompanied by a calf.

The annual number of calves born then may be taken as more than compensating for the number of mature animals killed by wolves. The number has to be somewhat in excess to provide against the number that die from natural causes. This number, however, is exceedingly low. It would be foolish to argue that the wolf makes a practise of hunting down the best conditioned and strongest animals. Every instance we saw of caribou having been destroyed by wolves showed us that rarely are any calves killed, rarely any but the oldest cows, and usually either the aged bulls or the bulls when straggling in the autumn heavy with fat and encumbered with great horns, inclined rather to stand at bay after a short gallop, than to continue a prolonged and hopeless flight across country. The first animals to fall are those that, wounded or sickly, have failed to gain the sanctuary of some isolated island. The number of sickly individuals was found to be negligible. Only one was come across that appeared in this condition, an aged bull found on the Hanbury River route, and he, strange to say, appeared to be suffering from old age rather than from any specific disease.

In winter when the snow is on the ground the wolf is somewhat at a disadvantage; though a fast mover, he is not essentially built for speed, and the caribou with their specially constructed feet can travel so rapidly and easily that the wolf must have learned long ago that chasing perfectly conditioned animals through deep snow often results abortively. Moreover such caribou would doubtless take the opportunity to join up with the first herd met with. The sickly animal, however, apart from his loss of speed, would be less inclined to follow the main herd, and could be more easily diverted from doing so. In winter, therefore, the female and young caribou who keep to the treeless country, although travelling straggled out over the country, are to some extent protected by their fleetness.

In summer the wolf comes into his own in the matter of ability to travel rapidly, but in summer the females and young usually are in large bands, and again only the stragglers that remain behind and the ill-conditioned individuals are subject to ravages. Moreover the lakes and rivers are open, and the caribou know instinctively that once in the water they are immediately in the ascendent, being remarkably rapid swimmers as compared to the wolf. A caribou will swim almost any distance, he will enter almost any water no matter how swift or disturbed by wind, and the wolf's one object is to prevent his reaching it.

The cows and calves are what must be protected primordially, but as yet there seems to be no danger of their extinction from these causes. The bulls suffer to a large extent no doubt, and the smallness of their numbers somewhat surprised me, but even so the fact that all the cows we saw had young with them causes us no alarm on their account.

In the southern portion of their range where the bull caribou move into the woods during the winter, the slaughter must be heaviest, and from what we can gather the number of wolves within the confines of the forest would appear to be on the increase. Every endeavour should be made to check this increment, because it would appear that the wolf of the timber to-day is of little economic importance. The reason for this increase, if it is such, is possibly due to the fact

that in certain localities the introduction of the domesticated animal provides him with a more or less dependable food supply.

Whether the wolf is subject to periodical decreases in numbers in the north as are, apparently, most of the fur bearers, is a moot point. I am inclined to believe that they are, and will deal with this matter later.

Before considering the advisability of wholesale wolf destruction as applied to the animals that have the treeless country for their natural habitat, we must determine their economic importance. Here there is no question of their destroying noxious rodents given to eating and killing young trees or valuable plant life, because the foxes of the region are ever sufficiently abundant to deal with any that there may be; moreover, except for a certain amount of grass and moss there would appear to be little vegetation of value except as providing the means of sustenance for the caribou, and these types of vegetation do not appear to suffer from the depredations of the rodents of the region.

The economic importance of wolves, disregarding their value as fur bearers, may be considered almost solely with regard to their status where the caribou are concerned. Although many have been of the opinion that the Northern Plains could support more than twice the number of caribou that they do at present, I find myself unable to rule so broadly. Within historic times no evidence has been brought to show either an increase or decrease in the number of these animals as a whole. Only have natives and hunters occasionally reported a mysterious falling off in numbers in certain districts. These are to be explained simply, it may be supposed, by the fact that the establishment of trading posts and trappers' buildings, and intensive hunting have served to deflect the animals from such districts. Nature, it would seem, has allotted to a primitive people, and certain species of mammals, a definite area in which, under natural conditions, all to which the allotment has been made will live and have their being as nature has ordained. Such is the balance of nature. Nothing is placed on this earth in its natural state without purpose, and it may be justly assumed that the wolves of the north are there for some good reason. They are there indirectly to preserve the identity of the various species with which they are associated.

No one who has hunted in those regions where primitive conditions still prevail can fail to be impressed with the healthiness of the game. Rarely do we find unhealthy individuals where game is subject to the attacks of carnivorous beasts. There is no more striking exemplification of this than the caribou of the north. They are unquestionably the finest herd of big game that I have ever seen, and I have hunted in many parts of the world. They exemplify the survival of the fittest; none but the perfect are allowed to live and breed, hence their perfection. We believe that the wolf is in no small degree responsible for this high standard, and that were he killed off the species as a whole would suffer. Not only would there be an immediate increase in numbers, but individuals though aged or otherwise unfit would be enabled to breed and cause a general tendency to degeneration. The effects of over-crowding, excessive interbreeding, and other unnatural agencies are shown by the domestic reindeer herds in Alaska and elsewhere. There the animals are subject to many diseases and infections which are not observed amongst the wild animals.

The wolf is undoubtedly the natural scavenger of the species, and as such his status must be considered.

If it should become necessary to control his numbers it would seem better to adopt some other method of control than the system that has been in vogue up to the present, namely the use of poison. The use of poisons can only be indiscriminate if the cunning wolf is to be killed off, and as such it contitutes a menace to the valuable white foxes as well, which are killed in our estimation at the rate of about ten to every wolf. If the matter has to receive consideration, it can only be satisfacttorily undertaken scientifically. The average man sent to destroy wolves is not generally interested in his work except in the very capacity in which he has been despatched to his given district. He is there to trap, shoot, and poison wolves, and except that he will study the animal in its cunning ways, he probes no deeper into the matter. It is hardly to be expected that he would do so, he is jealous of his position and he would consider it bad business to bring to light some new method of control which, employing the scientist, would lose him his own position. The wolf-poisoner, unless he be either of private means or so given to science that material gain is to him a secondary consideration, intends poisoning to go on until someone else and not he discovers the truth of the matter, and it is to be expected that he will not co-operate wholeheartedly with those whose investigations are likely to bring about his downfall; a man cannot serve two masters.

History has shown us that all such menaces as these, including such as the plague-carrying rat, have only been dealt with satisfactorily when science has intervened, and so it is with the wolf. No matter whether it be the wolf of the timber,

or the Arctic wolf, conclusive evidence to prove that any one method of control is economically sound, will not be forthcoming until the matter has been threshed out by interested scientists in the field.

The caribou are of great economic importance to us. The north country, because of them, is potentially valuable, and even if it comes no sooner it will take but another war with its consequent rationing to prove the truth of this to us.

The Musk-oxen must not be left out of the question either. So far as the domestication of the wild game animals of the north is concerned, there is little doubt that these animals are the better adapted for it. The wild caribou herds will one day be put to national use, but not, probably, before the musk-oxen have been farmed, an industry that would bring man into closer contact with the caribou and give him a chance to scheme on their account.

So far as we could see the range of the musk-oxen on the Thelon River was free of wolves. The country in this district is extremely sandy, and at the time of the year when we were there wolves usually travel at the water's edge. We moved about to a considerable extent and while doing so were careful to note any signs of wolves, Hornby holding that the bear and not the wolf is the musk-oxen's greatest enemy. But search as we did, and numerous though the musk-oxen were, we saw no evidence of their presence at all. This was one of the most striking observations we recorded. It may signify little, but it does show that at that time of the year, and for a period of some weeks before we arrived there, the range was free of these voracious animals.

Donald MacMillan wrote to me recently and his testimony is that of all other investigators in the northern regions. I quote him verbatim:

"The wolf is their (the musk-oxen's) greatest enemy, cutting out the calves from their mothers, and even surrounding big bulls and gradually wearing them down—lone animals banished by the younger bulls of the herd." His first remark, that concerning the calves is typical, but in the latter he makes a wise reservation. I do not disagree with respect to the herds with which we came into contact, but I cannot refrain from remarking that I believe few calves suffer in this manner. We saw many calves with their mothers, and on no occasion did we observe any tendency on the part of the former to straggle without the mothers immediately taking account of the fact. A wolf could not attack and destroy a calf very rapidly, and because it may be supposed that they rarely wander to any great distance from their mothers the attacks of wolves do not constitute a serious menace. The sickly and aged, as is the case of the caribou, no doubt fall before them, as well as an occasional calf, but the wolves themselves alone do not constitute a grave danger except when their attackes are associated with the ravages wrought by man.

It is the same with both of these valuable species, the caribou and the musk-oxen, primordially they must be protected to a greater extent from man. Man is more easy to control than the inaccessible wild animal. If, however, the encroachment of civilization seems likely to threaten the existence of the game, the number of the wolves must be regulated so as to preserve the balance demanded by the lessening of their available food supply. The methods employed to effect this control, I feel, should be other than the use of poison.

As I wrote during my sojourn in the north, if the wolf is subject to the periodical fluctuations to which are most, if not all, of the other species of fur bearers, the reason and causes of these fluctuations must be investigated, and if necessary exploited. If any disease is discovered that conforms to an epizootic, bacteriologists could prepare toxins for the purpose of spreading the disease at intervals amongst the wolves. The hypodermic syringe could be used to convey the infection to the pups in spring, or to individuals specially bred for the purpose. Care would have to be taken, however, to determine whether the disease in question could possibly be conveyed to other animals, and under no circumstances should the system be employed until a satisfactory and safe conclusion has been arrived at.

(To be continued)

A DAY WITH THE TUFTED TITMOUSE AT TORONTO

By STUART L. THOMPSON

ON Good Friday, March 29, 1929, we had the pleasure of making prolonged observation of the Tufted Titmouse (*Bæolophus bicolor*) this being the second occasion, as far as I know, of its occurrence at Toronto. The weather was fine and warm, Mrs. Thompson, her friend, Miss Alley, of Toronto University, and myself planned to spend the entire day afield. Our choice of locality on this occasion was a dense wood of conifers and deciduous trees

on the edge of Scarboro Bluff, some eighteen miles east of the city. We had long had this spot in mind and this holiday offered us our opportunity to explore it.

In the course of our rambles we had become separated. Amid the many calls and songs to be heard on all sides, I heard a loud resounding *Whee-o whee-o-wheeo,* coming from the depth of the woods. Half expecting to find a red-shouldered hawk, I went forward in the direction of the calls looking for a large bird as the call suggested. But, though I could see far through the naked limbs, no large bird was in sight. So clearly was the call enunciated that I naturally imitated in response. In a couple of minutes I saw a small bird flitting from tree to tree, coming my way, whistling loudly at every perch. I could see clearly through the glasses that the bird was a Tufted Titmouse. On he came evidently looking for the other Tit which so persistently replied to his calls. It was really amusing to see his eagerness. He dashed about here and there, peering this way and that, calling and listening, thoroughly puzzled. Several times he came within twenty feet of my head. Finally, apparently at a loss to locate the other bird, he squatted on a limb with trembling wings uttering a low thin "scree-ing" note.

I was very anxious for the others to see this rarity so, by a short cut through the woods and whistling the "whitethroat" call—our understood signal for meeting—I found Mrs. Thompson and her companion and brought them back to "meet" the Titmouse. He behaved admirably. Although out of sight and silent, I soon got a response by whistling *whee-o-whee-o* as before. He came from the depths of the woods, tree after tree, and again we were favoured by many views of this active little crested midget as he frantically sought for the other Tit who answered him. But before long he gave it up and returned to the deeper woods.

Later on, when we met again, Mrs. Thompson told me that she had seen him again and brought him to her by whistling.

As noon drew near we ate an outdoor lunch of bacon fried over a fire, hot coffee, and sandwiches. A band of chickadees was attracted by such signs of repast and, as they flew about expectantly, naturally the suggestion of feeding them came to us. We stuck pieces of bread about on the twigs near us and soon were rewarded by seeing the confiding little birds alight near us and feed freely. They seemed to have more fear of each other than of us. We were amused sometimes to see absurd angry little tussles or some huge (?) bully of a chickadee who drove off others and dined at will. But even better than these sights a few feet from us, was the fact that both Mrs. Thompson and Miss Alley had the novel experience of having chickadees perch on their outstretched hands and feed several times. It is significnat to note here that Mrs. Thompson was wearing a scarlet tam which did not seem to embarrass the birds in the least. The Tufted Titmouse did not put in an appearance at the picnic at all.

Incidentally it is strange the view we humans take of such experiences as this. We enjoyed watching chickadees help themselves to our provender. Had they been Blue Jays or Crows would we not have considered the birds thieves and stealing?

The following couple of hours were spent without difficulty amid the ample bird-life of the same woods. Then, later in the afternoon, we came again to the scene of our camp fire and noon-day meal. The chickadees were still feeding on the bread on the bushes. But they had company now. Among them was the Tufted Titmouse and as much at home as one of them. Without restraint we approached and at a distance of fifteen and twenty feet we watched him feeding. He lingered long over his repast trying several crusts, standing on some, beside others and clinging chickadee-like to others—but in silence throughout.

It occurred to me now to try his patience again by calling. He responded at once, ceased eating and answered with a loud whistle. But this time it was a different note. Not the smooth *whee-o* of before, but more sharply and abruptly uttered. It might be written *Wheet-o, Wheet-o* in two distinct syllables, rather than the long *whee-o* in which the first vowel was slurred into the other. Again he went off on a mad search for the other Tit. From time to time he varied his calls so that in all we heard: First—a low thin *see-see-see-see* accompanied with trembling wings. Second—a harsh grating *Scray, scray.* Third—a call which clearly showed the family relationship with the chickadee, *Sic sic sic quay quay quay-y.* The first part is identical with the chickadee's well-known call, the second part more harsh and nasal than that bird's final syllables. We followed him some distance through the woods, listening and noting down these various calls till at length he vanished amid the haze of trees and upper branches. This was the last we saw of him. We have hunted and called through the same woods on two occasions since but failed to have either sight or sound of our Titmouse friend again. We can only believe he paused in this wood for one day and is now in parts unknown.

Apart from this memorable experience, March 29 was full of interest, so much so that without going outside of five hundred yards during the

entire day we noted thirty different species of birds. We finally ended the holiday by a very close approach to four Long-eared Owls which we discovered roosting in a dense cedar grove—part of a day's birding with us is to find an owl or two of some kind before going home.

EDWIN BEAUPRE

By R. O. MERRIMAN

IN THE death of Edwin Beaupre, bird-study in Canada loses one of its most enthusiastic and careful field observers and collectors, and his associates lose a valued friend.

Edwin Beaupre was the youngest son of Edward Beaupre and his wife, born Esther Moffatt, and was of French blood on his father's side and of Scottish and Irish extraction through his mother. He was born in Portsmouth, Ontario, and received his early education at a private school, and, except for a short time in early manhood spent in Alberta, he lived all his life in Portsmouth and Kingston, Ontario. He was in the hotel business for some years, and later was a wine merchant, and since the advent of prohibition he was a manufacturer of carbonated beverages. He was a widower without children, having married, in 1904, Anna Leahy, of Cleveland, who died in 1914.

When Edwin Beaupre was a boy, a chance meeting with the late Dr. C. K. Clarke, then superintendent of "Rockwood", the provincial lunatic asylum at Portsmouth, led to a lasting friendship and infected Beaupre with Dr. Clarke's enthusiasm for bird-study, for which he was widely known. Beaupre himself dated his scientific interest in birds from 1894, when he started his ornithological library with a copy of McIlwraith's "Birds of Ontario," and taught himself to prepare bird skins and to mount birds. His collection of birds, which were mostly mounted specimens, did not grow to large proportions; but at his death his collection of eggs included a good representation of Canadian birds. He collected constantly through the neighbourhood of Kingston and along the lakes of northern Frontenac County and the adjoining counties, and made collecting trips to more distant breeding grounds. He exchanged with collectors in other parts of Canada, but he did not habitually buy or sell specimens; for he was a conservationist as well as a collector, and he was keenly aware of the danger to rare species through the work of the commercial collector. Among his longer collecting trips may be mentioned his visits to the Gulf of St. Lawrence, (the Magdalen Islands, Percé Rock and Bird Rock), in 1903 and 1926, his trip to the Georgian Bay in 1918, and his last trip, to the neighbourhood of Fort Assiniboine, Alberta, north of the Athabasca River, in the spring of 1929. On this last trip he was especially pleased to observe the breeding of the Solitary Sandpiper; for he had been indirectly connected with, but had never accepted, one of the now generally rejected records of this species nesting on the ground in Southern Ontario. Beaupre was an accurate and conservative observer, supporting his observations by collecting specimens whenever necessary, and making notes on breeding habits and habitats, migration, and many other topics. He also used photography and bird-banding as methods of bird study. He contributed occasional notes to *The Canadian Field-Naturalist* and other magazines; but his usual method of making known the fruits of his observations was by letter, his correspondents including the late E. H. Forbush, P. A. Taverner, A. C. Bent, several members of the staff of the Royal Ontario Museum of Zoology and others. At the Ottawa meeting of the American Ornithologists' Union, of which he was an associate, he met several of his correspondents for the first time, and in some instances for the only time.

He was unable to watch the migration of birds this spring, and in May he was taken to the Hotel Dieu Hospital, Kingston, where he died on June 2, 1930, aged 58. After his illness was known to be mortal, he was delighted to receive a set of eggs of the Canada Jay, from a homesteader in Northern Alberta with whom he had lodged during his trip in 1929, and from the hospital he gave directions for the care of these specimens. The collection which thus interested him to the last days of his life now goes by his will to the Royal Ontario Museum of Zoology. In religion he was a Roman Catholic, and his requiem was sung in St. Mary's Cathedral, Kingston. R.I.P.

RED-HEADED WOODPECKER IN WINTER AT TORONTO

By JAMES L. BAILLIE, Jr.

IT IS the purpose of this note to place on record several instances of the occurrence of this bird in winter at Toronto. There are records of the species having been seen occasionally in winter in other parts of southern Ontario, *e.g.*, in Kent county and at Coldstream, London and Elora, but the literature contains only four records of it at Toronto during the winter season, in 1890 (Thompson)[1], in 1905 (Fleming)[2], in 1921 (Harrington and Starr)[3] and in 1929 (Rutter)[4].

Although very numerous here at one time[5], the Red-headed Woodpecker has become, of recent years, much reduced in numbers. It is still, however, one of the familiar breeding birds of the Toronto region. Twenty-six years of migration records of Toronto naturalists (on file at the Royal Ontario Museum of Zoology) supply the average date of arrival, namely May 3, which is one day later than the average arrival date at London (one hundred miles to the south-west) according to seventeen years of records compiled by the McIlwraith Ornithological Club[6]. The earliest date of arrival at Toronto (excepting birds that may have wintered) is April 14, in 1922 (six birds) and on April 19 of the same year the birds were present in one small section of southern High Park. In the autumn it has usually disappeared by the end of September, the latest record being of six birds seen an October 16, 1921.

There is no evidence to indicate that it had ever been found here in winter until February 28, 1886, on which date Mr. Hubert H. Brown, saw one in the grounds of the University of Toronto. The bird had wintered in the neighbourhood and the record is taken from Mr. Brown's journal in the possession of the Museum. Four years later, on March 20, 1890, one was seen at Lorne park by Mr. Ernest E. Thompson (*loc. cit*).

Not until the winter of 1904-05 was the species again noted in the winter and during that season three were seen, one at the corner of Avenue road and St. Clair avenue (December 9 and February 4 and 11) by Mr. Stuart L. Thompson and one in High Park on January 28 by Mr. Oliver Spanner (according to the journals of Mr. J. H. Fleming). In his diary for 1907 Mr. Stuart Thompson states that he saw one on February 16 on Davenport road and two in "Roache's ravine" on March 23.

Then came a period of fourteen years during which there is no record of any Red-headed Woodpeckers having sojourned here through the winter but in 1920-21 at least four of them remained throughout the season. Two of these frequented the oak-covered east hillside of southern Grenadier pond (December 19 to March 26) where they were seen regularly by Mr. R. G. Dingman and the writer. The third was observed on Januray 22 in the Mount Pleasant cemetery grounds and the fourth on February 19 at the foot of McLean avenue, Balmy Beach, both by the writer.

During the following winter (1921-22) four were again seen throughout the season but this time all were frequenting the same locality on the bank of Grenadier pond. They were seen on different occasions between October 23 and April 8 by Messrs. Thompson, Harrington, Starr and the writer, on certain days all four birds being observed. Harrington and Starr recorded three of them on their Christmas census (*loc. cit.*).

In 1924 Mr. John Townson noted a single bird at Fisherman's island on Januray 27 and February 7, according to his notes supplied to the Museum. In 1925 Mr. Holton B. Haugh saw two at Grenadier pond on December 31 and it is very likely that the birds spent the whole winter there.

This winter (1929-30) the Red-headed Woodpecker is once more passing the winter with us, at its old haunts on Grenadier pond. The birds, two of them, were first seen as early as December 8 and on the 22nd of the month members of the Brodie Club, taking their fifth Christmas bird census, saw them (Rutter, *loc. cit.*). Throughout the winter the birds were seen by several other local naturalists and a second pair was discovered wintering in the neighbourhood of the zoo, in High park not far from Grenadier pond.

Observations over a period of forty-four years at Toronto thus show from one to four individuals of the species to have been present during nine winters. Several of the winter occurrrences can be unquestionably correlated with mild and open seasons but in the instance of the present winter such is not the case. The early part of the winter was particularly cold and at least until the third week of February the ground was continuously blanketed with snow of sufficient depth to cover any food-supply that might have been available on the ground. Unlike the Hairy Woodpecker, this species exhibits a decided liking for small fruits and berries and this fact, combined with the bird's

[1] E. E. Thompson, *Trans. Can. Inst.*, 1 : 60, Oct. 1890.
[2] J. H. Fleming, *Auk*, 24 : 76, 1907.
[3] D. Harrington and F. A. E. Starr, *Bird-lore*, 24 : 10, 1922.
[4] R. J. Rutter, *Can. Field-Nat.*, 44 : 38, 1930.
[5] *Handbook of Toronto*, 1858, p. 53.
[6] Leaflet published in 1927.

habit of storing away in loose bark and cavities beechnuts and acorns for future use, probably solves the question of their food supply in snowy seasons.

It is granted that a few individuals can find sufficient food to persist through even an especially inclement winter but why they choose to remain here is not so clear. It is unlikely that as many as four birds all suffered physical handicaps or injuries that would prohibit migration.

Since four of the last nine winters have seen red-heads sojourning in a certain section of High park, it would seem that,—given an adaptable species capable of subsistence on a more or less omnivorous diet, place it in a protected, wooded ravine where a supply of food is to be had in bad weather,—all individuals of the species *may* not migrate.

NOTES AND OBSERVATIONS

MORTALITY OF JUVENILE BLACK-BACKED GULLS AT LAKE GEORGE, NOVA SCOTIA.—During the last decade the writer has visited the well-known nesting grounds of the Black-backed Gull at Lake George, Yarmouth County, at different periods during the breeding time of these birds. A number of these visits were made in May when the islands on which they lay, some six or seven in number, were well covered with eggs. At such times a small number of adult birds, approximately four to eight, were found dead in various stages of decomposition. The ones which had most recently died were examined but no cause for their death could be determined. It is the writer's opinion that they may have succumbed to the ravages of old age.

In the four years from 1925 to 1928 four hundred and sixty-five juvenile birds were banded on Gull Island which is by far the largest island of the group. This work was performed by Mr. Basil Colbran, of Windsor, and the writer who visited the island during the month of July for that purpose. At the time of these visits the young showed various stages of development, a few being in the downy stage while many others were well able to fly and take wing at our approach, the latter readily eluding us. The dates of these respective visits were as follows: In 1925, July 21st; in 1926, July 28th and 29th; in 1927, July 22nd, and in 1928, July 21st. It was found that July 28th was rather too late, the other three visits being more timely as the young were very readily caught.

During these four banding excursions we found approximately thirty or forty dead immature gulls each year and a number of others which were so sickly that they probably died and in no case were the sickly birds banded. The dead birds which had died most recently and the sickly birds were invariably examined and in every case it was found that the tops of their heads were severely bruised, the wounds on the living birds frequently showing fresh blood. What agency was responsible for this condition we were not able to determine but we are firmly of the opinion that these birds were killed or injured by adult gulls other than their own parents, for when these fly in from the coast bearing food for their own offspring, it is quite reasonable to assume that this food is eagerly sought by numbers of other young gulls and these unwelcome intruders are no doubt repulsed by being pecked on the head which often proves fatal.

In the month of October, 1926, this island was visited by two duck hunters from Port Maitland and in their travels they by chance noticed the remains of a young gull with a band on its leg. Thinking that there was a cash reward for each band so recovered, they searched for others with the result that twenty bands were thus found and subsequently turned in. It was in 1926 that the largest number of birds were banded, namely one hundred and eighty-seven. Unfortunately similar searches were not made in the other three years for which reason it is impossible to state whether the ratio of mortality among the birds which were banded in 1926 was high or low. All of the banding of these birds was done under my supervision and I am morally certain that in not a single case were any birds, which were so handled, injured by us.

If this banding is carried on at Lake George another year, it is my intention to re-visit the scene of the banding operations myself within a few weeks for the purpose of gathering further information of a more accurate nature concerning the subject at hand.—R. W. TUFTS.

A BRONZED GRACKLE FOSTER PARENT.—During June, 1929, while I was staying at my mother's summer residence at St. Michel, Bellechasse County (opposite Quebec city), Quebec, I frequently noticed a pair of Bronzed Grackles about the house. Whenever we went on the gallery the female Grackle flew from branch to branch in a near-by tree, scolding noisily. I looked for her nest but could not find it, but did find a Chipping Sparrow's nest, containing three young, in a grapevine that was trained along the gallery. I was surprised not to see any sign of the parent Chipping Sparrows, and watched the

nest carefully, first from a window, and then from a doorway. Finally, I saw the female Grackle go to the nest and feed the young Chipping Sparrows; she fed them three or four times in my presence, not more than a few feet from me. That afternoon one of the young Chipping Sparrows flew from the nest to a tree near by, and was followed by the female Bronzed Grackle, which showed every sign of maternal anxiety.—WILSON BAILLAIRGE.

LESSER SCAUP BREEDING AT TORONTO.—It can easily be imagined that I was both surprised and delighted to see a duck of this species (*Marila affinis*) and her brood of seven young swimming about near the throngs of people at Toronto Island on July 27, 1929. At that time the young could not have been more than two or three days old. When I first saw them they emerged from under the willow bushes that grow along the edge of the lagoon on Toronto Island and I saw them every day from that date until September 12 when I left Toronto for some weeks.

The most amazing thing about the young scaups was the rapidity with which they grew. In five weeks (about September 1) they were nearly fully grown and were able to fly short distances. About this time the male made his appearance. For a few days he was not allowed to associate with his family but in the course of a week they were all united.

Wood Ducks, Black Ducks and Blue-winged Teal formerly bred in the marsh at Ashbridge's bay, at the east end of Toronto harbour, but this scaup is the first of the diving ducks to raise a family in the vicinity of Toronto in my recollection.—JOHN TOWNSON.

WHISTLING SWAN AT RIGAUD, QUEBEC.—A Whistling Swan (*Olor columbianus*) was shot at Rigaud, Quebec, during the first week of November, 1925. Identity was established by E. G. White who saw the bird which had been mounted by a taxidermist.—HOYES LLOYD.

BANDS OF BIOLOGICAL STATION, HELGOLAND, GERMANY, BEING USED IN CENTRAL AMERICA.—In "News from the Bird Banders", published by the Western Bird Banding Association for January, 1930, it is stated that Mr. Walter Wenzel is banding Vaux Swifts (*Chætura vauxi*) at El Zopte, Gautemala, with the bands of the Biological Station, Helgoland, Germany. Since this species occurs in British Columbia, it is possible that birds bearing these bands may be found there. Anyone finding a Swift bearing one of these bands should report the fact to the National Parks of Canada Branch, Department of the Interior, Ottawa, Canada, for the Canadian banding records, and the Parks Branch will advise the bander.

A TARDY HORNED LARK.—Mr. Fred W. Osborne, Guardian of St. Mary Islands Bird Sanctuary, on the north shore of the Gulf of St. Lawrence, has written to me in a letter, dated February 19, 1930, that at his winter home in the village of Harrington Harbour, Saguenay County, Quebec, which is also on the north shore of the Gulf of St. Lawrence, "We also had a Horned Lark feeding around the place until January 28th. They may be common in Canada the year through, but to my knowledge I never saw any later than November of any year".—HARRISON F. LEWIS.

HAWK KILLED BY ELECTROCUTION.—The night of the 3rd-4th of May, 1930, a high tension wire carrying a heavy voltage broke near Montmagny, P.Q., a place about 40 miles below Quebec on the south shore of the St. Lawrence. The separate ends touched the ground not far from each other, and the current continued running.

In the morning when the men went to make repairs they found between the ends of the wire, where the current had been passing, a large hawk with his wings outstretched, sort of half sitting on his feet and his tail, and in his claws a field-mouse which he had just caught, and they had both been electrocuted. It is interesting to surmise whether the mouse crossed the danger zone alone, and was killed, and then acted as an electrified bait for the hawk, or whether the mouse was running away, and they were both killed at the same time.

The father of a young lady who works in our office is the Manager of the Power Company, and she saw the hawk and the mouse exactly as they were found, as the repair man came to get her father to show them to him before moving them. Unfortunately, I could not find out what kind of a hawk it was, or what had become of it.—R. MEREDITH.

OUTSIDE NESTS OF FLYING SQUIRRELS.—In the April, 1930, issue of *The Canadian Field-Naturalist*, Mr. Jas. L. Baillie, Jr., had a paper regarding "Outside Nests of the Flying Squirrel (*Glaucomys v. volans*)" which interested me, inasmuch as I have only found one such nest in thirty-three years.

This nest was found on May 5, 1899, at Walnut Hill, Montgomery County, Pa., (twelve miles north of Philadelphia), in a hemlock wood on a rocky creek bluff, and contained two blind, naked young. The female was frightened from the nest and captured. The nest was 25 feet up in a small hemlock, placed in a cluster of shoots, against the thin trunk; it was oval shaped, composed of hemlock twigs, dead leaves, grasses and fine bark strips, built thickly with fine bark shreds, and had the entrance hole, 2 inches in diameter, in the side of the trunk; it was about 10 inches in diameter and compactly built.—RICHARD F. MILLER, Philadelphia.

BOOK REVIEWS

THE MAMMALS OF ONTARIO *by E. C. Cross and J. R. Dymond. Royal Ontario Museum of Zoology. Handbook No. 1. University of Toronto Press. 1929. Price Twenty-five cents. 8vo. pp. 56, 1 map and 4 line drawings.*

During the past few years the members of the staff of the Royal Ontario Museum of Zoology have been showing commendable zeal in reviving interest in the study of the fauna of the Province in various ways: (1) by stimulating the young field-naturalists of the Toronto region; (2) by making intensive studies and systematic collections of the animal life in hitherto neglected districts; and (3) by publishing short papers on faunas of different parts of the Province of Ontario.

As the authors of the report under review have truly stated, one of the great difficulties met by naturalists beginning the study of many groups of animals in Ontario is the lack of publications describing the different forms found in the Province. This is partly due to incomplete knowledge of many forms, and partly to existing knowledge being scattered and practically unavailable to most students. The importance of such knowledge is coming to be recognized, as the crop of fur-bearing mammals in Ontario runs into millions of dollars annually, the big game mammals produce many thousands as a food supply in many districts, and probably still more is spent by sportsmen and tourists who are interested in the big game mammals—deer, moose and bear—to say nothing of the large proportion of the population who derive æsthetic pleasure from the wild life.

The authors have listed 68 species of mammals authentically known to occur in Ontario within recent times, with additional subspecies bringing the number of recognized forms up to 87, adding that "it is quite probable that future study will add a number of species to those known to occur within our boundaries." It may be mentioned that the Ungava Phenacomys was first taken in Ontario in 1925, and the Little Short-tailed Shrew (*Cryptotis parva*) was taken for the first time in Ontario (and in Canada) only in 1928. While no attempt has been made to give descriptions of all the forms, the general characters of the main groups are given. Brief descriptions, in some cases with line drawings of essential characters, are given of the species which are apt to be confused, so that the student may be able to identify most of the common forms. An important feature consists of notes on the present status of many species. The subspecies are treated in footnotes under the species and their treatment is generally confined to their geographical ranges. A fairly complete and classified list of the most important published works is given for the benefit of those who wish to pursue their studies further.

Attention is called to some general principles of animal distribution in the Province, with reference to a map of Ontario showing the life zones generally recognized in the Province. The Carolinian life zone is shown to extend along the north shore of Lake Erie south of a line drawn from Lake St. Clair to the west end of Lake Ontario. The Transition zone lies north of the Carolinian and south of a line from northeast end of Georgian Bay to the Ottawa River. The Canadian zone is north of the Transition and south of a line drawn from the middle of James Bay west to the Manitoba border. The Hudsonian zone includes all the area north of the Canadian zone in Ontario, with the possible exception of a narrow strip along the southwest side of Hudson Bay, which certainly has Boreal characteristics, although the Boreal zone is not mentioned. The authors are well-advised in stating that there is no hard and fast line demarking the distribution of the various animals in the different zones, as there is much intermingling of animals on the borders of different zones and some animals range widely in two or more zones. For that reason the designation of range and habitat by life zones is unsatisfactory.

The reviewer has in the past found great difficulty in reconciling the alleged distribution of species in the Province of Ontario, owing to a general prevalence of "terminological inexactitude" in the geographical sense. Ontario is a Province of vast geographical extent and irregular borders, with its eastern border on Quebec extending farther east than Philadelphia and its western boundary on the Manitoba and Minnesota side much farther west than Minneapolis. In latitude the Province extends from far up the west side of Hudson Bay to Pelee Island, on the line of Northern Ohio and Indiana on the south. Some naturalists are still following the nomenclature of a century ago when Ontario was a narrow settled strip along the upper St. Lawrence River and the eastern Great Lakes known as "Upper Canada," and continue to refer to London and Windsor as in western Ontario. While not designating any definite geographical or physiographical divisions of the Province, the authors of this handbook have apparently classed any district south of Georgian

Bay, Parry Sound, and Algonquin Park as Southern Ontario, and the remainder of the Province as Northern Ontario, which on the whole corresponds roughly with the boundary between the Transition and Canadian zones.

Attention is called to the importance of studying fluctuations in the numbers of mammals, the differences between animals of the same species from different localities, and the fact that many closely related animals are fitted for different conditions. Average measurements are given for each species listed, brief accounts of its life habits, food, economic value, and its principal enemies. In at least one instance the authors have fallen into error, in giving the chief enemies of the Arctic Fox as wolves and polar bears. Many years of field experience with these species have satisfied the reviewer of the virtual lack of competition between these species. While an occasional hungry wolf may eat foxes caught in traps, the foxes are too small to be of much importance to wolves and the foxes are far too alert to fall a prey except under very exceptional circumstances; while the foxes which live on the sea ice in winter where polar bears are found, habitually accompany the bears as friendly, or at least tolerated, parasites, living largely on the discarded remnants and blood of seals killed by the bears. The same may be said of foxes and wolves on the land, where there are plenty of caribou, and the foxes glean the carcasses left by the wolves.

In the present state of our knowledge the authors can hardly be criticized for not attempting an enumeration of the pinnipeds and cetaceans which have a place in the mammal fauna of Ontario, but the title of the report might more properly have been the "Land Mammals of Ontario." There are old records of the harbour seal (*Phoca vitulina*) in both the Ottawa and upper St. Lawrence rivers, and as Ontario is working towards real maritime expansion in the north, we should not forget the ringed seal (*Phoca hispida*) and bearded seal (*Erignathus barbatus*) and probably the Atlantic walrus (*Odobenus rosmarus*) in Hudson and James Bay. The cetacean population is more problematical but the white whale (*Delphinapterus leucas*) occurs in Hudson and James Bays, and possibly also the bowhead may come within Ontario waters as it is known from the northern part of Hudson Bay.

This little book fills a long-felt need, and should be in the hands of everyone who is interested in the mammal life of Canada. A copy should be in the hands of all Ontario teachers of zoology, and as nearly every country boy who hunts or traps, and every Boy Scout, sees animals which he would like to be able to name or to know more about, a copy should be in every school library in the Province.—R. M. ANDERSON, National Museum of Canada.

INSECTS, TICKS, MITES AND VENOMOUS ANIMALS OF MEDICAL AND VETERINARY IMPORTANCE. *By Walter Scott Patton and Alwin M. Evans, 786 pages, 60 plates and 734 figures. Price 20 shillings, including postage to any part of the world. Obtainable only from the Entomological Department, Liverpool School of Tropical Medicine, England.*

This work has been prepared by authors well qualified for the undertaking—Prof. Patton's studies in tropical diseases and of the insects and other animals related to them, are well known. Dr. Evans has also had a distinguished career as an investigator of animal carriers of disease and her work has been very favourably commented upon. We believe that the authors in preparing this volume have fully lived up to their reputation and that it is a work of exceptional merit; well planned for the object in view and almost indispensable to the student aspiring to study tropical diseases.

The book replaces Patton and Crigg's *Textbook of Medical Entomology* which the authors state is now "out of date and out of print".

The matter dealt with is arranged as a series of 28 "meetings" including 20 lectures, rather than in chapters, the lectures being intended to cover a "course for the Diploma in Tropical Medicine, University of Liverpool and for the Diploma in Tropical Medicine and Hygiene in other tropical schools and universities".

There is no table of contents and in view of the continuous nature of the subject discussed it is difficult to give a definite summary of the text. Accepting the "meetings" as divisions the subjects would run somewhat as follows:—

First meeting.—A brief classification of the animal kingdom. Groups of animals of medical and veterinary importance, including a "short classification of parasites and their carriers used in the school".

Second and Third meeting.—External anatomy.

Fourth and Fifth meeting.—Internal anatomy.

Sixth to Eighteenth meeting.—Classification and bionomics of Diptera and their part in the spread of disease.

Nineteenth and Twentieth meeting.—Studies in fleas.

Twenty-first meeting.—Studies in lice.

Twenty-second and Twenty-third meetings.—Studies in ticks.

Twenty-fourth meeting.—Studies in mites.

Twenty-fifth meeting.—Stinging, vesicating and venomous animals.

Twenty-sixth meeting.—Dissecting, collecting, preserving and breeding.

Twenty-seventh meeting.—Repellents and control measures.

The discussions are clear and full and the illustrations so good that they help immeasurably to understand the text. By far the greatest portion of the book deals with classification but in addition the bionomics of many of the species are described and following this a less extensive outline of the diseases with which they are associated is given. A vast majority of the diseases and carriers depicted belong to tropical countries but while this is so it must not be supposed that we in Canada are wholly free from them. The spotted fever tick *Dermacentor venustus*, as the authors state, occurs in British Columbia and we might add that it has also been taken as far eastward as Manitoba. Houseflies, stableflies, fleas and lice are in our midst and all of these have been proved to be carriers of disease. Among the items in the final 35 pages are a list of mosquito repellents and a table showing disease carrying mosquitoes, the diseases they disseminate and the countries they inhabit.

Brief but interesting statements are given describing the causes of disease and how the infection is brought about; much of this information has appeared in journals inaccessible to the average person and on that account it is practically unknown. We might, as an example, draw attention to the statement on page 196: "Until recently *Stegomyia fasciata* was the only known insect victor of the unknown virus of yellow fever, but it is now known, as the recent work of Bauer and Philips has shown, that several allied Aedians can also transmit the parasite." And again under typhus fever: "This disease cannot, as far as known at present, be acquired in any other way than by the bite and the fœces of the louse".

At the end of the volume is a large chart, illustrated by drawings of the animals, giving a classification of the Arthropods of medical importance. The work is to be followed by three additional volumes, Part 2 *Public Health*, Part 3 *Tropical Hygiene* and Part 4 *Veterinary*.

The book is admittedly for class work and as such it should find a place in every university. It will also prove a useful reference work to the economic entomologist, especially for those specializing in medical entomology and other animals affecting the health of man. Noteworthy features are the number and excellence of the illustrations, most of which are original and prepared especially for this volume.

There will be those who would like to see a more definite division of the subject matter into chapters but when it is realized that the subjects have been arranged for class work the objection will not carry so much weight. Indeed the merits of the book are so great that we can readily overlook the few apparent defects.—NORMAN CRIDDLE.

ORNITHOLOGICAL INVESTIGATIONS NEAR BELVEDERE, ALBERTA, 1926. *By P. A. Taverner. National Museum of Canada. Bulletin 50, pp. 84-104. Ottawa, 1928.*

Belvedere, some eighty miles north-west of Edmonton, has become well known to zoologists through the careful investigations of Mr. A. D. Henderson and it was important that collections should be made for the National Museum in this region. Mr. P. A. Taverner was accompanied by Mr. Hamilton M. Laing and the late Mr. C. G. Harrold. Some three months were spent in the field, with results that add much to our knowledge of the breeding ranges of many Canadian birds.

Bonaparte's Gull was found breeding about Belvedere and northward to the Fort Assiniboine region, as Mr. Henderson has already recorded. The American Golden-eye, the Bufflehead and the White-winged Scoter, are mong the more interesting ducks found breeding. In 1925, Mr. Henderson took the eggs of the Dowitcher in the Fort Assiniboine region, and the Museum is fortunate in the gift of a nest and eggs by Mr. R. C. Harlow. It is interesting to learn that the Hungarian Partridge has already become resident in the Belvedere region. There is an unexpected record of the Indigo Bunting, and at last we have authentic records of the Connecticut Warbler breeding.—J. H. FLEMING.

BIRDS AND MAMMALS OF THE MOUNT LOGAN EXPEDITION, 1925. *By H. M. Laing, P. A. Taverner and R. M. Anderson. National Museum of Canada. Bulletin 56, pp. 69-107. Ottawa, 1929.*

This is a welcome addition to our scanty knowledge of the fauna of the glacial region of south-western Canada. Mr. Laing accompanied the Mount Logan Expedition as far as the upper Chitina river, where he established camp at the foot of the Chitina moraine. The country proved difficult to traverse and no crossing of the Chitina river was possible. Collections of animals, birds and plants were made in the different life zones, with results that fully justify Mr. Laing's reputation as an efficient and discerning field-naturalist, much of the time alone and always in a difficult

country. Mr. Laing has added much valuable material to the National Museum. The list of birds is annotated by Mr. P. A. Taverner and in the subspecific determinations show a distinctly eastern tendency. The mammals have been determined by Dr. R. M. Anderson

The text throughout is marred by an excessive use of the blue pencil.—J. H. FLEMING.

OFFICIAL CANADIAN RECORD OF BIRD-BANDING RETURNS

Published by Authority of the National Parks of Canada Branch, Department of the Interior, Canada

RETURNS UPON BIRDS BANDED IN 1913.

BRANDT'S CORMORANT, No. A.B.B.A. 14088, banded by O. J. Murie, at Three Arch Rocks, Orgeon Coast, on July 4, 1913, was killed a year or so before August 14, 1929, and was reported by a resident of Alert Bay, British Columbia.

RETURNS UPON BIRDS BANDED IN 1922.

GLAUCOUS-WINGED GULL, No. 201,252. nestling, banded by Theed Pearse, at Mitlenatch, north of the 50th parallel in the Strait of Georgia, British Columbia, on July 30, 1922, was found dead at Brunette Creek, Maillardville, New Westminster, British Columbia, on July 24, 1929.

BLACK DUCK, No. 101,149, banded by H. S. Osler, at Lake Scugog, Ontario, on August 20, 1922, was killed at Lake Erie, near Lakeside, Ohio, during the fall of 1928.

BLACK DUCK, No. 228,448, banded by H. S. Osler, at Lake Scugog, Ontario, on October 8, 1922, was killed at Denson's Landing, Tennessee, on January 3, 1929.

RETURNS UPON BIRDS BANDED IN 1923.

GLAUCOUS-WINGED GULL, No. 232,867, nestling, banded by Theed Pearse, at Mitlenatch, Strait of Georgia, British Columbia, on August 12, 1923, was found injured at Beverly Hills, Washington, on November 17, 1928. The band was removed and the bird released.

RETURNS UPON BIRDS BANDED IN 1924.

BLACK DUCK, No. 297,919, banded by H. S. Osler, at Lake Scugog, Ontario, on October 26, 1924, was shot at Onancock, Virginia, on January 14, 1929.

PINTAIL, No. 305,433, m., banded by J. G. Cunningham, at Lulu Island, British Columbia, on April 7, 1924, was killed at Colusa County, California, on January 12, 1929.

RETURNS UPON BIRDS BANDED IN 1925.

HERRING GULL, No. 225,213, yg., banded by Dr. D. A. Dery, at Razades d'en bas, Temiscouata County, Quebec, on July 17, 1925, was found dead at Fall River, Massachusetts, on December 14, 1928.

BLACK DUCK, No. 323,825, banded by H. S. Osler, at Lake Scugog, Ontario, on September 24, 1925, was shot at Brush Creek, Hamlin Township, Monroe County, New York, on November 15, 1928.

BLACK DUCK, No. 389,316, banded by H. S. Osler, at Lake Scugog, Ontario, on October 3, 1925, was caught in a muskrat trap, at South Monaghan, Ontario, during the month of April, 1928.

BLACK DUCK, No. 389,077, banded by H. S. Osler, at Lake Scugog, Ontario, on October 19, 1925, was killed at Currituck Sound, North Carolina, on January 1, 1929.

SCAUP DUCK, No. 301,731, m., banded by S. M. Batterson, at Mohler, Oregon, on January 7, 1925, was killed at Pedder Bay, British Columbia, on December 16, 1928.

CHICKADEE, No. A35,202, ad., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on September 21, 1925, repeated on November 1 and November 2, 1925, and was found dead in a shop, in the same locality on November 22, 1928. Death probably caused from flying against the window pane.

RETURNS UPON BIRDS BANDED IN 1926.

GREAT BLACK-BACKED GULL, No. 418,740, juv., banded by Harrison F. Lewis, on Eastern Island, St. Mary Islands, Saguenay County, Quebec, on August 4, 1926, was caught at Tweed Island, Newfoundland, during the year 1926.

HERRING GULL, No. 418,711, juv., banded by Harrison F. Lewis, on Middle Island, St. Mary Islands, Saguenay County, Quebec, on August 3, 1926, was probably killed at Trout River, District of St. Barbe, west coast of Newfoundland, on January 1, 1929.

COMMON CORMORANT, No. 301,425, juv., banded by Harrison F. Lewis, at Lake Island, Saguenay County, Quebec, on July 16, 1926, was found dead at Cross Island, Maine, on January 3, 1929.

MALLARD, No. 409,343, f., banded by F. C. Lincoln, at Bath, Illinois, on January 8, 1926, was killed on September 15, 1928,—reported by a resident of Thicket Portage, Manitoba.

MALLARD, No. 409,755, banded by F. C. Lincoln, at Bath, Illinois, on January 11, 1926, was caught in a muskrat trap, at Leask, Saskatchewan, on May 10, 1929.

MALLARD, No. 388,546, m., banded by Paul E. Page, at Lac Ste. Anne, Alberta, on August 22, 1926, was shot at Beardstown, Illinois,—reported on January 25,1929.

MALLARD, No. 322,960, juv., f., banded by Bert Lloyd, at Davidson, Saskatchewan, on September 26, 1926, was shot at Bell City, Louisiana, on December 13, 1928.

BLACK DUCK, No. 457,514, banded by H. S. Osler, at Lake Scugog, Ontario, on October 3, 1926, was shot at Hunting Island, off the coast of South Carolina, on December 19, 1928.

BLACK DUCK, No. 457,651, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed at Wassaw Island, Savannah, Georgia, during the month of January, 1929.

BLACK DUCK, No. 457,664, banded by H. S. Osler, at Lake Scugog, Ontario, on October 9, 1926, was killed at Lac Nichicun, Central Quebec, on March 18, 1929.

BLACK DUCK, No. 457,846, banded by H. S. Osler, at Lake Scugog, Ontario, on October 13,

1926, was shot at Lockbourne, Ohio, on December 22, 1928.

BLACK DUCK, No. 464,106, banded by H. S. Osler, at Lake Scugog, Ontario, on October 14, 1926, was killed at Erie, Michigan, on November 15, 1928.

BLACK DUCK, No. 464,134, banded by H. S. Osler, at Lake Scugog, Ontario, on October 15, 1926, was killed at Crisfield, Maryland, on January 2, 1929.

MALLARD, No. 456,101, banded by F. H. Rose, at Moiese, Montana, on October 15, 1926, was shot at Golden Spike, Alberta, during the fall of 1927.

SWAINSON'S HAWK, No. 233,107, banded by Herman Battersby, at Oak Lake, Manitoba, on August 19, 1926, was shot at Northwood, North Dakota, on May 26, 1929.

BLACK-HEADED JAY, No. 439,767, banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 29, 1926, repeated several times in 1926 and 1927, once in 1928, and was killed in a squirrel trap, one-quarter of a mile from the place where it was banded, on October 3, 1928.

CROW, No. 406,598, juv., banded by Robert Morton, at Springfield, Manitoba, on June 6, 1926, was shot on April 3, 1929, and was reported by a resident of North Transcona, Manitoba.

BRONZED GRACKLE, No. 49,325, banded by H. Battersby, at Oak Lake, Manitoba, on July 16, 1926, was killed in the same locality in which it was banded, on June 10, 1929.

REDPOLL, No. 34,329, ad., f., banded by Ralph E. DeLury, at Ottawa, Ontario, on March 13, 1926, repeated the following day in the same trap, was found alive but in a weak condition, at Fairy Lake, four miles north of place where banded, near Hull, Quebec, on March 14, 1926. The bird died the same day.

HOARY REDPOLL, No. 184,706, ad., m., banded by Ralph E. DeLury, at Ottawa, Ontario, on April 5, 1926, repeated several times, and was found dead at the Experimental Farm, on April 25, 1926.

JUNCO, No. 184,535, banded by Mrs. J. S. Chamberlain, at Amherst, Massachusetts, on April 8, 1926, was killed by a cat, at Le Quille, Annapolis County, Nova Scotia,—reported on April 22, 1929.

RETURNS UPON BIRDS BANDED IN 1927.

BLACK GUILLEMOT, No. 293,354, juv., banded by Harrison F. Lewis, at Yankee Harbor, Saguenay County, Quebec, on July 28, 1927, was found dead at Little Egg Harbour Bay, New Jersey, on May 15, 1929.

GREAT BLACK-BACKED GULL, No. 422,-521, banded by R. W. Tufts, at Lake George, Yarmouth County, Nova Scotia, on July 22, 1927, was found dead at South Harpswell, Maine, on May 30, 1929. The body was badly decomposed when found.

CALIFORNIA GULL, No. 544,677, yg., banded by Frank L. Farley, at Gull Island, in Bittern Lake, 12 miles west of Camrose, Alberta, on June 22, 1927, was killed near Mud Lake, forty miles northwest of Idaho Falls, Bonneville County, Idaho, on November 1, 1927.

CALIFORNIA GULL, No. 544,812, yg., banded by Frank L. Farley, at Gull Island, in Bittern Lake, 12 miles west of Camrose, Alberta, on June 22, 1927, was found at Lac la Biche, near Big Bay, Alberta, on July 4, 1929.

RING-BILLED GULL, No. 565,961, banded by Wm. I. Lyon, at St. Martin's Island Shoal, Michigan, on July 12, 1927, was caught in a fish net at Belle Anse, Gaspé County, Quebec, on November 6, 1928.

COMMON TERN, No. 584,987, nestling, banded by Edward S. Thomas, at Middle Island, about two and one-half miles due south of Pelee Island, Lake Erie, Ontario, on July 22, 1927, was found dead in the same locality, on July 1, 1929.

MALLARD, No. 405,457, banded by T. E. Musselman, at Lima Lake, near Meyer, Illinois, on March 22, 1927, was shot at Bradwell, Saskatchewan, on November 15, 1928.

MALLARD, No. 379,928, banded by J. A. M. Patrick, at Yorkton, Saskatchewan, on September 20, 1927, was killed at Fonehill, about 10 miles west of Yorkton, Saskatchewan, on September 4, 1928.

MALLARD, No. 602,520, banded by F. H. Rose, at Moiese, Montana, on September 29, 1927, was found dead at Glenevis, Alberta, on May 2, 1929.

MALLARD, No. 421,920, ad., f., banded by D. H. Bendick, at Leduc, Alberta, on October 4, 1927, was killed at Bayou Meto, Lonoke County, Arkansas, on December 22, 1928.

MALLARD, No. 594,270, banded by F. H. Rose, at Moiese, Montana, on November 2, 1927, was shot at a lake, fifty miles west of Medicine Hat, Alberta, on November 11, 1928.

MALLARD, No. 594,768, banded by F. H. Rose, at Moiese, Montana, on November 6, 1927, was shot at Mountain View, Alberta, during the fall of 1928.

BLACK DUCK, No. 557,455, banded by W. B. Large, at Rochester, New York, on November 13, 1927, was caught at Demers Centre, Quebec, on April 19, 1929.

BLACK DUCK, No. 596,514, banded by W. B. Large, at Rochester, New York, on November 17, 1927, was killed on the Kenogami River, Ontario, on June 20, 1929.

BLACK DUCK, No. 557,627, banded by W. B. Large, at Rochester, New York, on December 4, 1927, was caught in a muskrat trap, at Arden, Ontario, on April 4, 1929.

PINTAIL, No. 333,180, banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on February 1, 1927, was shot at Golden Spike, Alberta, during the fall of 1927.

GREAT HORNED OWL, No. 301,324, banded by George Lang, at Indian Head, Saskatchewan, on May 28, 1927, was found at Clavet, near Saskatoon, Saskatchewan, on August 2, 1929.

BRONZED GRACKLE, No. 361,759, ad., m., banded by Ralph E. DeLury, at Ottawa, Ontario, on June 5, 1927, was shot at the Experimental Farm, 300 yards from the place of banding, on September 7, 1928.

BRONZED GRACKLE, No. 384,612, yg., banded by Bert Lloyd, at Davidson, Saskatchewan, on June 8, 1927, was drowned in a water trough at Loreburn, Saskatchewan, on July 19, 1929.

SHUFELDT'S JUNCO, No. A61,603, ad., m., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on April 27, 1927, repeated twice in 1927, once in 1928,

and was killed by a squirrel in a trap on September 21, 1928.

SHUFELDT'S JUNCO, No. 573,704, im., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on September 16, 1927, repeated several times in 1928, and was found dead in the same locality, on May 10, 1928.

SONG SPARROW, No. 183,691, banded by Arthur Morley, at Swampscott, Massachusetts, on April 14, 1927, flew into a house at Newport Landing, Hants County, Nova Scotia, on or about July 3, 1929. The bird was kept and fed for several days and then released without its band.

RETURNS UPON BIRDS BANDED IN 1928.

MURRE, No. 531,665, juv., banded by Edmund H. Fletcher, at St. Mary Islands, Saguenay County, Quebec, on July 18, 1928, was shot at Mingan Harbour, Saguenay County, Quebec, on November 4, 1928. This band was originally reported as placed on a Juvenile Razor-billed Auk by Mr. Fletcher. In forwarding the recovery, Mr. George Maloney reported the bird as a Murre. In view of the fact that Mr. Fletcher was handling numerous birds, while Mr. Maloney had only the one specimen to deal with, and was competent to identify this bird, his identification has been accepted.

HERRING GULL, No. 703,622, fledgeling, banded by W. B. Grange, at Hat Island, Green Bay, Wisconsin, on June 30, 1928, was shot at Bersimis Reserve, Bersimis, two hundred and twenty-five miles below Quebec, during the month of October, 1928.

HERRING GULL, No. 706,688, banded by Wm. I. Lyon, at Little Gull Island, Delta County, Michigan, on July 3, 1928, was found dead in Prince Edward County, Ontario, on June 22, 1929.

HERRING GULL, No. 660,463, juv., banded by Edmund H. Fletcher, at St. Mary Islands, Saguenay County, Quebec, on July 20, 1928, was trapped about November 10, 1928, by a resident of Pigeon Hill, New Brunswick.

CALIFORNIA GULL, No. 555,335, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 23, 1928, was shot at Czar, Alberta, on May 25, 1929.

CALIFORNIA GULL, No. 555,342, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 23, 1928, was killed in a trap at MacLeod, Alberta, on July 2, 1929.

CALIFORNIA GULL, No. 699,002, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 23, 1928, was found dead at Wetaskiwin, Alberta, on June 17, 1929. The bird had probably been dead since the previous fall.

CALIFORNIA GULL, No. 699,175, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 23, 1928, was found dead at Brawley, California, on December 8, 1928.

CALIFORNIA GULL, No. 699,422, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 26, 1928, was caught at Colusa, California, on December 20, 1928.

CALIFORNIA GULL, No. 699,467, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 26, 1928, was found dead at San Luis Obispo, California, on February 22, 1929.

CALIFORNIA GULL, No. 699,875, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 28, 1928, was shot at San Francisco, California, on January 6, 1929.

CALIFORNIA GULL, No. 699,886, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles north west of Camrose, Alberta, on June 28, 1928, was shot at Edmonton, Alberta, on September 15, 1928.

CALIFORNIA GULL, No. 699,898, juv., banded by Frank L. Farley, at Gull Island, north end of Bittern Lake, 15 miles northwest of Camrose, Alberta, on June 28, 1928, was shot at Didsbury, Alberta, on September 15, 1928.

DOUBLE-CRESTED CORMORANT, No. 303,755, banded by Bert Lloyd, at the north end of Last Mountain Lake, Saskatchewan, on July 21, 1928, was captured in a lumber shed at Millville Florida, on February 26, 1929. The bird was probably killed.

DOUBLE-CRESTED CORMORANT, No. 303,826, banded by Bert Lloyd, at the north end of Last Mountain Lake, Saskatchewan, on July 21, 1928, was shot at Jackson Bayou, St. Mary Parish, Louisiana, on January 17, 1929.

DOUBLE-CRESTED CORMORANT, No. 466,924, banded by Bert Lloyd, at the north end of Last Mountain Lake, Saskatchewan, on July 21, 1928, was shot at Little Arm, Regina Beach, Regina, Saskatchewan, on September 15, 1928.

DOUBLE-CRESTED CORMORANT, No. 466,937, banded by Bert Lloyd, at the north end of Last Mountain Lake, Saskatchewan, on July 21, 1928, was killed at Horse Shoe Lake, Seyppell, Arkansas, on November 20, 1928.

DOUBLE-CRESTED CORMORANT, No. 466,984, banded by Bert Lloyd, at the north end of Last Mountain Lake, Saskatchewan, on July 21, 1928, was found dead at Sherburne, Louisiana, reported on October 27, 1928.

MALLARD, No. 326,306, m., banded by F. R. Butler, at Elk Lake Game Farm, near Victoria, British Columbia, on January 18, 1928, was shot at Brentwood, Vancouver Island, British Columbia, on January 30, 1928.

MALLARD, No. 498,319, banded by Clarence E. Chapman, at Oakley, South Carolina, on February 6, 1928, was killed at Moss Lake, 100 miles north of Indian Lake, Manitoba, during the month of October, 1928.

MALLARD, No. 496,394, ad., m., banded by Paul Willson, at Mile High Duck Club, Brighton, Colorado, on February 12, 1928, was shot at Beechy, Saskatchewan, on October 27, 1928.

MALLARD, No. 557,022, partial albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was killed at Bastrop, Louisiana, on January 10, 1929.

MALLARD, No. 557,064, partial albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was shot at Bayou Meto, Arkansas, on January 10, 1929.

MALLARD, No. 557,072, banded by Bert Lloyd, at Davidson, Saskatchewan, on July 21, 1928, was killed at Tipperary, Arkansas, on January 31, 1929.

MALLARD, No. 557,073, partial albino, banded by Bert Lloyd, at Davidson, Saskatchewan, on

July 21, 1928, was shot at a place six miles east of Stalwart, Saskatchewan, on November 14, 1928.

BLACK DUCK, banded about April 15, 1928, by Mr. Hubert L. Mallory, at Mallorytown, Ontario, with a band bearing the inscription "H. L. Mallory, Escott, Ontario, Canada," was killed on Beaver Dam Lake, Tunica County, Mississippi, on January 18, 1929.

BLACK DUCK, No. 656,332, banded by V. E. Gould, at Wolfville, Nova Scotia, on June 14, 1928, was shot at Cherry Hill, Nova Scotia, on December 23, 1928.

SHOVELLER, No. 656,094, banded by Alex. Glennie, caretaker of Many Island Lake Bird Sanctuary, at Walsh, Alberta, on June 25, 1928, was killed at Rudy Slough, seven miles northwest of Salt Lake City, Utah, on December 8, 1928.

PINTAIL, No. 601,791, m., banded by E. W. Ehmann, at Lake Merritt, California, on January 17, 1928, was shot at Fort Providence, North West Territories, on September 12, 1928.

PINTAIL, No. 567,457, banded by Wm. P. Sparks, at Waco, Texas, on February 2, 1928, was shot at the Rae Detachment, Royal Canadian Mounted Police, Great Slave Lake, North West Territories, on September 23, 1928.

PINTAIL, No. 600,234, banded by Wm. P. Sparks, at Tehuacana Club Lake, Waco, Texas, on February 14, 1928, was killed at a place three miles north of Bistcho Lake, at the extreme N.W. corner of the Province of Alberta, on June 14, 1929.

PINTAIL, No. 600,759, banded by F. W. Robl, at Ellinwood, Kansas, on March 5, 1928, was shot at Mantario, Saskatchewan, during the year 1928.

KILLDEER, No. 384,627, banded by Bert Lloyd, at Davidson, Saskatchewan, on June 27, 1928, was shot on the Platte River, Butler County, Nebraska, on November 18, 1928.

RUFFED GROUSE, No. 208,603, ad., banded by Ralph E. DeLury, at the Experimental Farm, Ottawa, Ontario, on March 17, 1928, flew into a post and killed itself, in the same locality, during the month of May, 1928.

MARSH HAWK, No. 227,545, banded by John Wilkie, at Point Edward, Ontario, on July 15, 1928, was shot at West Panolu Plantation, Lake Providence, Louisiana, on December 5, 1928.

CHIMNEY SWIFT, No. B52,637, ad., banded by R. O. Merriman & assistants, in a chimney trap at Nicol Hall, Queen's University, Kingston, Ontario, on June 9, 1928, was re-captured in the same chimney on July 20, 1928, and was found dead in the same locality on May 23, 1929.

CHIMNEY SWIFT, No. B52,845, ad., banded by R. O. Merriman & assistants, in a chimney trap at Nicol Hall, Queen's University, Kingston Ontario, on July 20, 1928, was trapped and accidentally killed in the same chimney, on May 10, 1929.

CHIMNEY SWIFT, No. B52,965, ad., banded by R. O. Merriman & assistants, in a chimney trap at Nicol Hall, Queen's University, Kingston Ontario, on July 20, 1928, was trapped and accidentally killed in the same chimney, on May 10, 1929.

CROW, No. 223,249, ad., banded by John W. Piggott, at Bridgetown, Nova Scotia, on February 11, 1928, was shot in the same locality about January 5, 1929.

STARLING, No. 483,986, banded by E. S. Thomas, at Columbus, Ohio, on January 4, 1928 was found dead at Strathroy, Ontario, on December 1, 1928. Reported as dying from cold.

COWBIRD, No. 337,668, ad., f., banded by Ralph E. DeLury, at Ottawa, Ontario, on April 26, 1928, was killed in the same locality, on May 3, 1928.

YELLOW-HEADED BLACKBIRD, No. 588,-384, yg., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on June 24, 1928, was found dead in the same locality, on July 1, 1928.

BREWER'S BLACKBIRD, No. 463,687, ad., m., banded by P. S. Walker, at the University of British Columbia, Point Grey, British Columbia, on April 1, 1928, was killed by a cat in west Point Grey, Vancouver, British Columbia, on April 4, 1929.

BRONZED GRACKLE, No. 507,813, banded by C. E. Folsome, at Oscoda, Michigan, on April 16, 1928, was shot at Jamestown, Ontario, on June 1, 1929.

BRONZED GRACKLE, No. 643,827, m., banded by Philip Siemens, at Hepburn, Saskatchewan, on May 1, 1928, was found with a broken leg at North Battleford, Saskatchewan, on June 27, 1929.

PINE SISKIN, No. B27,652, ad., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on June 14, 1928, repeated several times and was killed on July 20, 1928.

GAMBEL'S SPARROW, No. 576,119, ad., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on May 6, 1928, repeated on May 6, 1928, and was found dead in the same locality, on May 20, 1928.

OREGON JUNCO, No. 492,953, ad., banded by Gladys Hamersley, at Crofton, British Columbia, on February 1, 1928, repeated on February 3, 1928, and was found dead in the same locality, on February 23, 1928.

OREGON JUNCO, No. B5,229, ad., banded by Gladys Hamersley, at Crofton, British Columbia, on February 4, 1928, was found dead in the same locality, on February 23, 1928,

SHUFELDT'S JUNCO, No. B12,902, ad., f., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on May 5, 1928, repeated several times in 1928, and was found dead in a post hole, in the same locality, on May 21, 1928.

SHUFELDT'S JUNCO, No. B12,939, ad., f., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on May 9, 1928, was killed in a trap by a Sparrow Hawk, in the same locality, on May 12, 1928

SONG SPARROW, No. 494,732, ad., banded by Ralph E. DeLury, at Ottawa, Ontario, on April 15, 1928, repeated on May 10, and May 17, 1928, was found dead in the same locality on June 1, 1928.

SONG SPARROW, No. 519,127, ad., banded by Joseph Wendle, at Bowron Lake, Barkerville, British Columbia, on April 18, 1928, was found dead at Newlands, British Columbia, on June 24, 1929.

LINCOLN'S SPARROW, No. B27,597, ad., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on June 7, 1928, repeated on June 9, 1928, and August 4, 1928, and was killed in a trap in the same locality, on September 10, 1928.

ROBIN, No. 467,943, ad., m., banded by T. T. & E. B. McCabe, at Indianpoint Lake, Barkerville, British Columbia, on April 26, 1928, was found dead in the same locality on August 14, 1928. The bird had apparently been dead some time.

ROBIN, No. 104,494, im., banded by R. W. Tufts, at Wolfville, Nova Scotia, on June 4, 1928, was found dead in the same locality, on July 4, 1929. The bird had apparently been dead for some time.

RETURNS UPON BIRDS BANDED IN 1929.

MALLARD, No. A624,144, f., banded by R. M. Stewart, at McGillivray Creek Game Reserve, Chilliwack, British Columbia, on January 1, 1929, was shot at Dewdney, British Columbia, on January 28, 1929.

MALLARD, No. 654,204, banded by W. R. Priebe, at Twin Falls, Idaho, on February 3, 1929, was caught in a trap at Battle Lake, Alberta, on April 29, 1929. The bird's leg had been cut off just above the band. The bird escaped and was seen several times in the same locality, on June 4, 1929.

PINTAIL, No. A620,255, banded by E. W. Ehmann, at Lake Merritt, Oakland, California, on January 17, 1929, was killed at Cardston, Alberta, on April 16, 1929.

PINTAIL, No. A621,227, banded by A. D. Trempe, at Irvington, California, on January 31, 1929, was caught in a muskrat trap at Deep Lake, near Lake Athabaska, Alberta, on May 1, 1929.

PINTAIL, No. 543,507, banded by Wm. P. Sparks, at Tehuacana Lake, Waco, Texas, on March 8, 1929, was killed at Marcelia, Saskatchewan, on April 25, 1929.

STARLING, No. A304,186, banded by E. S. Thomas, at Columbus, Ohio, on March 8, 1929, was caught in a stable at Rosenthal, Ontario, on June 5, 1929.

SNOW BUNTING, No. 698,401, banded by Dave Fast, at Hepburn, Saskatchewan, on January 12, 1929, was found killed by a stray cat, in the same locality, on January 15, 1929.

SNOW BUNTING, No. B80,267, banded by Oscar M. Byrens, at McMillan, Michigan, on February 23, 1929, was found wounded, at Chelmsford, Ontario, on April 18, 1929.

CHICKADEE, No. B59,486, banded by Dave Fast, at Hepburn, Saskatchewan, on February 18, 1929, repeated in the same locality on February 19, 1929, and was found dead in the same locality, on March 2, 1929.

CHICKADEE, No. B59,488, banded by Dave Fast, at Hepburn, Saskatchewan, on February 19, 1929, repeated several times in the same locality during the month of March, 1929, and was eaten by a cat, one-half mile north of Hepburn, Saskatchewan, on April 15, 1929.

CHICKADEE, No. B59,493, banded by Dave Fast, at Hepburn, Saskatchewan, on February 20, 1929, repeated on February 21, 1929, and was found dead in the same locality, on March 3, 1929.

CHICKADEE, No. C3,274, yg., banded by R. H. Carter, Jr., at Muscow, Saskatchewan, on June 16, 1929, was found dead in the same locality, on June 20, 1929.

BACK NUMBERS WANTED

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DOUGLAS LEECHMAN :: *National Museum* :: OTTAWA, CANADA

Canada North of Fifty-six

By DR. E. M. KINDLE

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The Canadian Field-Naturalist

VOL. XLIV OTTAWA, CANADA, NOVEMBER, 1930 No. 8

THE HOME LIFE OF THE AMERICAN GOLDFINCH[1]

By HENRY MOUSLEY

SURELY the home life of a bird is a fascinating subject, yet how few really intensive studies can be found of even the commoner species, to say nothing of the rarer ones. Of the literature bearing on the present subject, I have so far found very little, the best accounts being those of Mary Emily Bruce in the *Auk* for July, 1898, "A Month with the Goldfinches", and that of the late Ora Willis Knight in his "Birds of Maine", 1908, neither of which, however, can be said to be strictly intensive, whilst the present paper, unfortunately, deals mostly with the later stages of the Goldfinch's home life.

My first visit to the nest—which was about six miles from Montreal—was made on August 14th of the present year (1929) in company with Mr. Terrill, who had previously found it on August 3rd, when it contained six eggs. On the day before our arrival, he had again visited it, when, instead of eggs, the nest contained five very ugly, nearly naked young birds, probably two or three days out of the shell. In deference to the wishes of my friend our cameras were set up about twelve feet from the nest, much too far away to my liking and that of my camera; my two pictures, one of the male perched on the top of the nesting tree, the other just below and to the right of the nest, showing the bird on a very small scale indeed. The only other item of interest on this occasion, was when the male bird fed his partner once—a habit very characteristic of the Goldfinches, as well as that of caressing one another—but I missed seeing this and have no picture of it—although, fortunately, Mr. Terrill obtained one—my attention at the time being devoted to examining a plant of the Hooded Ladies' Tresses (*Spiranthes Romanzoffiana*), an orchid I had hitherto not found round Montreal, although, so very common at Hatley and many other places in the Eastern Townships.

My next visit took place on the 16th, when, on this, and subsequent visits, I was alone, placing my camera less than five feet from the nest, whilst secreting myself under some small bushes about twelve feet away, so that I obtained an excellent view of the nest, without the birds seeing me. The nest, a somewhat large one, was situated four feet above the ground, in the forks of a sapling oak, being composed outwardly of fine soft vegetable fibre, bark strippings and silky plant fibres, compactly felted and lined with cat-tail down, the average dimensions being as follows:—Outside diameter 3.5, inside 2.5 inches; outside depth 3, inside 1.25 inches. It was not long before I discovered that the male was the bolder of the two, encouraging his partner later on by generally feeding the young first, and then waiting for her to do the same, when they usually went off together. The feeding of the young by this male is in direct contrast to the experience of the late Mr. Knight, who says: "The males seem to feed the females more or less even after the young are hatched, but rarely if ever do they feed the young birds, this as well as incubation being done almost exclusively by the mother". On the other hand, Miss Bruce's experience agrees with mine, for she speaks of the young being fed, sometimes by the male, sometimes by the female. In my case, during the twenty hours I was at the nest, the young were fed on eighteen occasions, nine by the male, and nine by the female, at intervals of about an hour, or to be exact, once in every 53.3 minutes, which agrees very well with Miss Bruce's experience, for she speaks of the parents feeding the young very "slowly and thoroughly" about once an hour. This continued slow rate of feeding came as a great surprise to me, after such a long experience with the warblers, who usually feed their young every ten or eleven minutes, and much oftener than that, as recorded in the *Auk* for April, 1926, in the case of a pair of Yellow Warblers (2), who during the twenty-nine hours I was at their nest in 1924, fed the young 389 times, or at an average rate of once in every 4.5 minutes—or again, in the case of a pair of

[1]Read before the Province of Quebec Society for the Protection of Birds, Montreal, October 14, 1929 (illustrated).

[2]*Auk*, Vol. XLII, No. 2, April, 1926.

Maryland Yellow-throats (3), which during the 110 hours Miss Nellie E. Shaver, assisted by others—was at their nest in 1917, fed the young 1234 times, or at an average rate of about once in every 5.35 minutes. These records fall down, however, when compared with that of Mr. Bigglestone, who, assisted by others as in the case of Miss Shaver, watched a pair of Yellow Warblers (4) in 1912, feed their young 2,373 times during the 144 hours of observation, which works out at an average rate of once in every 3.7 minutes.

Even this record is easily beaten by the female Black-throated Blue Warbler (5) which I watched in 1921, feed her two young 349 times in fourteen hours, or at the rate of once in every 2.4 minutes but this average is over a much shorter period of time than the others. The nearest approach to this slow rate of feeding that has come under my notice was in July, 1924, when a pair of Ovenbirds (6) that I was watching fed their young seventy-five times only during the forty-eight hours I was at their nest, or at an average rate of once in every 38.4 minutes.

On the present occasion (August 16th) I arrived at the nest at 9 a.m., but it was nearly noon before either of the parents ventured to feed the young—and then it was the male only, the female looking on from a small branch to the left of and somewhat below the nest,—the near proximity of the camera to their home undoubtedly being the cause. Possibly, the two events of greatest interest occurred later on, when I secured a picture of the female standing on the edge of the nest, as if contemplating whether to brood the young or not, and one of her actually in the nest, this being the one, and only, occasion during the whole of my visits, that she seemed disposed to brood the young. This again is in direct opposition to my experience with the Warblers which, in the early stages of the home life when brooding is necessary, invariably do so. Possibly the camera may again have had something to do with it, although, from the remarks of Miss Bruce, one gathers that in her case the young birds were little brooded, for she says: "although so seldom fed the little ones seemed to thrive on fresh air and sunshine". A good instance of this fresh air treatment is seen in another picture obtained wherein the young are peacefully resting with the mother again perched on the same small branch—already mentioned—to the left of, and somewhat below, the nest. Certainly, I must say she kept furtively glancing at the young, as indicated by her attitude in the picture—seemingly undetermined whether to brood them or not. Eventually, however, she gave up the idea, and went off to join her partner, with whom, apparently, she spent much of her time.

My next visit to the nest was on the following day (August 17th), when I again secured several interesting pictures of the parents feeding the young. On this occasion, however, it was the female who first fed them, two hours after my arrival, and who, contrary to the previous day, spent some little time, at intervals, round about the nest, uttering a series of notes which I interpreted at the time as *bee, bee, beeb, bare-bee* and *ba-be*, but never once did she attempt to brood the young, although, on two occasions she did remove an excreta sac, eating it once, and flying away with it the other, a quite unnecessary proceeding at this stage of affairs, when the rim of the nest, as is shown in the photographs, was lined with a fringe of excrement, so very different again to the Warblers, who as a rule keep their nests scrupulously clean, so clean in some cases, that after the young had left, I could have preserved the nest had I so wished, a thing not to be desired in the present instance, for on the insertion of a small twig into the lining of the nest, it was instantly covered with a swarming mass of mites, so different again to the experience of Miss Shaver, who in her study of the Maryland Yellow-throats, relates how "the nest throughout the period was kept in an immaculate condition". This fouling of the rim of the nest in the case of Goldfinches seems characteristic, for Mr. Knight speaks of the same thing occurring in the case of the Arkansas and Lawrence's Goldfinches in the West. The male was not much in evidence, although he passed over the nesting ground at times in the well known undulating flight, whilst giving vent to the *per-chic-o-ree* notes, as figured and described by Dr. Chapman in his "Birds of Eastern North America".

My next visit was not paid until two days later, or on August 19th, by which time the young birds were getting quite lively, standing well up in the nest to be fed, which was done by regurgitation, the parents pumping up the semi-digested food from their interiors before giving it to the young. So rapid was the method of delivery, that I can best describe it by saying that the parents literally spat the food into the mouths of the young, not fed it, "very slowly and thoroughly", the words used by Miss Bruce in her description, which certainly differs from my own experience, and that of others I have consulted. Mr. Knight best describes the process as a peculiar, pecking, spitting motion, which description exactly fits my view of it. So rapid, indeed, was the perform-

[3]University of Iowa Studies, Vol. VIII, No. 2, 1918.
[4]*Wilson Bulletin*, Vol. XXV, No. 2, 1913.
[5]*Auk* Vol. XLI. No. 2, 1924.
[6]*Auk*, Vol. XLIII, No. 2, April, 1926.

ance, that a shutter exposure of 1/50 of a second, to avoid all movement, would have been preferable to the 1/25, all that the varying conditions of light allowed me to give at the time. However, I obtained some very fair pictures of the feeding of the young, as well as the activities of the latter in the nest, which are well described by Miss Bruce when she says: "the young had a comical fashion of lying with their long necks stretched out and their heads hanging over the edge of the nest, their eyes half closed and their mouths wide open as if gasping for breath". This restlessness and gasping for breath, in my case, was certainly due to the heat of the sun as it emerged at times from behind clouds. It was more than evident by now, that the feeding grounds lay to the south of the nest, as they always went off and returned from that direction, never, however, flying direct to the nesting tree when returning, but always alighting first in some nearby tree or shrub, to make sure that all was well, before venturing near the nest. This they finally reached by flying to the top of the nesting tree, and from there working their way down and through it, always to the south side of the nest, all my pictures showing the young being fed from that point of the compass—only. This stereotyped method of arrival at the nest is by no means peculiar to the Goldfinches, many birds, especially, the Warblers, having a well defined route for reaching their nests, sometimes the male having a different one from that of the female and not the same, as in the present instance. On leaving, no definite routine was adhered to, both birds flying off in a southerly direction after the young had been fed. Fortunately, I was always made aware of their return by the twittering notes of the male, given when on the wing, and no doubt intended as a signal to the young of their parents approach. The female, as on the 17th, spent some little time in the vicnity of the nest, uttering the same notes as before, but never actually approaching the nest, whilst the male again passed over it at times. At this date, the young must have been at least eleven or twelve days old, and had they been Warblers would by this time have left the nest. Goldfinches, however, seem to spend an unconscionably long time in their home, Knight giving the period as from fifteen to sixteen days, which agrees with that of Miss Bruce, who says the young in her case left the nest on the sixteenth day. This being so, apparently four days had yet to elapse before the young in my case would be leaving, but judging from their present state of feathering and activity, I could hardly believe this possible, so decided to allow one more day only, to elapse, before again visiting them. It was fortunate I did so, for upon arrival at the nest at 11 a.m. on the morning of August 21st, one young bird almost immediately left, before I had even time to set up the camera. However, I managed to obtain some interesting pictures of the others, which could now be fourteen, fifteen or perhaps even sixteen days old, there being a margin of a week to account for between the finding of the incubated eggs by Mr. Terrill on August 3rd, and the young birds on the 10th, as already mentioned. The departure of the first bird was quickly followed by that of two others, so that by 11.15 a.m. two only remained in the nest, and both of these were gone by 11.30 a.m., just half an hour after my arrival, so that I was kept pretty busy taking their pictures, the last being of one which had flown into a little sapling birch, close to my hiding place, and which I had not noticed until eating my lunch at noon, when the repeated approach of the female to the spot, drew my attention to it. Being on a very slender twig, and not in a good position for feeding it, the mother—by her actions—was evidently trying to entice it away, as not long after its picture had been taken, it took courage and made quite a respectable flight, to a better and less open spot. To get his last picture, I had to leave my hiding place and set up the camera again, and it was whilst doing this, that I just caught sight of a large bird as it disappeared into my hiding place, where I had left my lunch and other paraphernalia lying about. As a clapping of hands failed to bring it out, I went to investigate, when up rose a fine female Marsh Hawk, but what had attracted it to the spot I cannot say, as nothing, apparently, had been touched, or was removed. After this little episode, I finished my lunch, and bade adieu to the last of the young Goldfinches, which I happened to notice perched on the far side of the nesting tree which, apparently, it had never left, being the smallest of the brood, the last to have left the nest, and the least able to fly, but which, some day, perhaps, when clad in a coat of gold, will not only bring a gleam of sunshine into the life of its partner, but also into that of the fortunate person who may be recording its home life, with those early courtship scenes, so characteristic of the Goldfinches.

ESKIMO STONE GRAVES IN NORTH-EASTERN LABRADOR AND THE COLLECTION OF ANTHROPOLOGICAL MATERIAL FROM THEM

By BERNHARD HANTZSCH

TRANSLATED BY M. B. A. ANDERSON

Translated by M. B. A. Anderson from "Über Eskimo-Steingräber im nordöstlichen Labrador und das Sammeln anthropologischen Materials aus solchen," *Abhandlungen und Berichte des Kgl. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden*, Dresden, Volume XII, 1908, pp. 55-58.

(*P. 55*)

SOME of the specimens discussed in a previous paper by Dr. Oetteking represent the result of my activity as a collector during a sojourn, in 1906, of about ten weeks in extreme north-eastern Labrador. While my expedition was intended primarily for ornithological research, I took advantage of the opportunity to examine about thirty or forty stone graves, many of which had fallen down and were completely empty. It may be stated with certainty that the skulls, parts of skeletons, and two fairly complete skeletons, come from individuals of unmixed race. The inhabitants of extreme north-eastern Labrador and Ungava Bay until recently have had little contact with Europeans; also interbreeding with Indians, as may occur in the South of Ungava Bay, is not probable in this district. The small amount of material collected by me in the neighbourhood of the mission station of Hebron, which is situated somewhat further south, comes from such old heathen graves, that purity of race can be vouched for in no less degree. With the Christianization of the natives the heathen burial customs are disappearing, and with them the slightest possibility of obtaining material for anthropological collections. The Christian Eskimos of the Labrador coast—and at the present time they are all Christians except a few in the extreme north-east—are buried in the ground in cemeteries. White people have examined the stone graves in all the better-known places in Labrador, and often have taken at least the skulls, or have paid well to have them brought to them by certain venal natives. Other graves have collapsed as a result of storms and other climatic influences; or bears, wolves, foxes, domestic dogs and other carnivorous animals have brought about their destruction. In the accessible parts of the district, it is difficult to discover an untouched stone grave, especially as the inhabitants like to conceal their existence, and usually oppose the removal of well preserved recent bones. Still, the material I collected may be of interest.

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The heathen method of burial according to my own investigations and the accounts of the Eskimos I questioned is as follows. They put on the dead person all his clothing and, if there is an abundance of new seal or caribou skins, they sew the body up in them in a sort of roll. Now they look for a near-by spot close to the sea, above high-water mark, usually on the summit of an elevation of land along the coast, and lay the dead man on a level surface of stone, or on the ground, from where when living he could see the sea and his gaze could reach his home. The body is stretched out at full length, never placed in a sitting posture or flexed. The hunting knife of a good hunter is placed under his right shoulder, and small objects of special value to the deceased, such as amulets, are added. Large flat stones are then dragged up and erected like a wall round the dead man, without touching the body. The resulting long structure is usually built in a very careful, regular and finished manner, all interstices filled with small stones, and toward the top the walls draw together. Right across this lower structure are laid heavy flat stone slabs, which often are dragged from a considerable distance. The stratified gneiss, which is the chief rock of the whole district, is suitable material for this purpose; elsewhere limestone is used. When the whole rock wall has been covered with slabs to a slight height above the dead man, smaller stones are laid above and the whole structure presents the same natural form as our earth-built graves. Only occasionally is a hollow stone structure erected at the head, in which certain possessions of the dead man are placed. At the foot, however, especially with men, an additional chamber is constructed, which is often lower than the grave itself, and serves mainly for the reception of the smaller possessions of the dead man, such as knives, harpoon and arrow heads, tools, snow-goggles, stone pots, etc. In many cases, especially farther south on the Labrador coast, these extra rooms are not built in close proximity to the main grave, but at some distance from it. Occasionally use is made of natural holes, cavities in the rock and spaces between large rock masses for this purpose, but the larger openings are

usually closed with stones, so that the work of the survivors is evident in such tombs. Now and then smaller possessions are merely laid nearby or superficially buried in the earth. If the investigator wishes to search thoroughly for other grave articles, he has to dig up the earth's surface near the grave carefully. The graves of women are often less well constructed than those of the men; frequently the little extra room is entirely lacking. In such cases the cooking gear of the dead woman is placed on the stone mound and her sewing tools and such little possessions as knives, comb, amulets, and the like, are placed near the body. I never found real articles of adornment, only beads and little bells of some length and little bells used as trimming, which were originally made from spoons (*P. 57*) but later were introduced by the Hudson Bay Company in trade. I saw few graves of children, and deduced that the Eskimo often spared themselves the trouble of constructing a stone grave for those who died quite young, and used other means of burial. Where they did take the trouble, however, as a rule they put shells and small bright stones—playthings for the children—on and near the mounds, and this custom still survives among the baptized Eskimos of to-day. In many cases I found white pieces of quartz on the graves of adults, which were often visible at some distance. Perhaps they are to serve as distinguishing marks, even for the spirits (Torn-get) in which they believe. Certain old mounds, which I visited were merely massive, almost impenetrable, heaps of stones. I suspect that these arose gradually, when the descendants and relatives of renowned people added new stones at every visit to the place—a well-known, widespread custom. In some few cases I discovered well preserved, but empty, graves, such as a child's grave near the mission station at Killinek. They told me that occasionally they erected stone graves for the drowned, or otherwise unburied and lost people, and this may have been the case with such cenotaphs. Several times rather large graves were shown to me in which two dead people have been laid together. Apparently it was a case where two had died at the same time, perhaps a married couple. Or such common graves contain the remains of people who have perished from hunger, cold, epidemics, etc., have been found later and buried by relatives or kind-hearted strange Eskimos. Occasionally they gathered the larger bones from disturbed graves, and put them in a new mound, where they lie in confusion. I found such a grave on the Tunnusuatsuk peninsula.

In earlier times the larger possessions of the man, especially his kayak, his sled, arrows and bow, harpoons, etc., were also placed near the grave; the team of dogs was often killed, or the animals tied so fast that they could not get loose and had to starve to death. In all these customs it was believed, naturally, that the deceased had need of things taken with him in the after life. To-day they keep the more valuable possessions and the relatives inherit them, or small worthless imitations of wood are placed on the graves. The ancient custom practised farther north of carving imitations in walrus ivory, when it is desired to keep the actual objects, does not seem to have been wide-spread among the Labrador Eskimos. In this district there was an abundance of drift wood. They often placed food near the graves. They do this frequently now, provided they have not forgotten the dead and still desire a blessing from the spirits of the departed. Is this heathen religion really ancestor worship, which does not easily disappear when people are baptized into Christianity? They like to put old cooking vessels on the graves of the women, tobacco for the men, a pipe, matches and other modern articles. Many white people take the objects away from the graves and lay worthless things there in exchange, to satisfy the Eskimos who accompany them. Wind, weather, or animals soon destroy these objects; probably the old sorcerers (Angakut) often took the things away too.

The stone graves in north-east Ungava Bay and extreme North-Eastern Labrador which I visited, are, as a rule, easily recognized in spite of their slight height, as soon as one is at all familiar with the landscape. Often they have been erected on an empty plateau, which probably resulted from the grinding action of the glaciers, of which there is an abundance in the district. Occasionally a mere heap of stones is mistaken for a grave. But it seldom happens that such a heap is regular in form. It is more difficult to recognize the graves in the valleys. In such localities there are many in close proximity to each other, and their discovery is thus rendered easier. Many of the burial places in this district have already been examined and disturbed, but localities farther away, such as the Button Islands, might show numerous untouched stone graves. But a traveller who goes to those districts for such collecting purposes cannot count on too much during one season, since the ground is frozen a great part of the year, and then investigation of the contents of the graves becomes almost impossible.

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An abundance of plant and animal life has developed inside the grave, due to protection from the wind, and the presence of decaying matter. Insects lay their eggs in the fleshy parts, and induce their more rapid decay; thick mosses grow luxuriantly around the gradually disintegrating body. Occasionally mice and ermine inhabit the protected stone structure, and I even found a deserted bird's nest, apparently that of a Snow Bunting, near the human bones. The back parts of the body decay very rapidly from the moisture of the moss-covered ground; shoulder-blades are soon perforated. The skeleton is likely to remain complete only on bare ground; but, according to my experience, in ten graves there is to be found hardly a single perfect skeleton. It cannot be estimated how many years pass until the large bones are entirely destroyed by the elements. Many skulls may last for about a hundred years; others, however, disappear much sooner. Smaller bones, especially in moist places, decay after 20 or 30 years or vanish completely. An imperfect skeleton collected by me was quite destroyed in the back parts and the finger and foot bones, while it still showed dried muscle and tendons between the ribs and pelvis. One may look through the stone slabs of the grave into the interior and still not be able to judge correctly the condition of the bones therein. Occasionally these are so decayed that they are not worth collecting. In order to reach the skeleton, it is necessary to carry away the head part of the stone mound, and this requires care to prevent the stones from falling in and injuring the bones. The help of the natives cannot be depended on in this work, since it is not easy to obtain their consent to disturb the graves. After the head part of the stone mound has been removed, the wet and soft bones must be lifted out carefully and laid on the grass to dry. Since the back parts as well as the hand and foot bones are usually covered with a layer of humus, and are entwined in a thick layer of moss, hours of work are needed in the case of older skeletons, in order to hunt up the smaller bones, in so far as these are not completely destroyed. Also the teeth, which have few forked roots, have almost always fallen out in great numbers and been covered with earth and plants. Careless people, especially Eskimos, can never be trusted to collect skeletons on this account, for they are seldom careful to collect all the bones. It is not a simple task to undertake the scientific excavation of graves. In spite of the assistance of the Eskimos I have spent many hours and days in order to secure the material now in the Anthropological Museum in Dresden. But he who once sets about the task of collecting should proceed in the most careful and thorough manner in order to rescue for science all the bones that remain. Any other form of collecting is objectionable. The Eskimos have been induced several times by large pay from missionaries, traders and distinguished visitors to the district to procure skulls. The Eskimos have then torn down the graves at the head and taken away the skulls—of course without the teeth which have fallen out. I found numerous graves like this: fallen in, the skeleton covered with heavy stones and destroyed, a picture of the most brutal and impious desecration. Such an action is deeply to be regretted in such a race whose representatives (which are still racially pure) number scarce 5,000, and are scattered over a large territory, which is difficult of access. I cannot think of any grave in the north-east tip of Labrador, which had been carefully and thoroughly emptied. May every visitor to such regions reflect on this point; that the collection of such objects is becoming more and more difficult, and, in a not far distant time, will be impossible, since not only are the old burial customs vanishing, but the whole Eskimo race itself is perishing.

SOME RECENT COLLECTIONS OF CANADIAN FRESH-WATER SPONGES

By FRANK SMITH
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SMALL collections of fresh-water sponges have been received by the writer at various times during the past ten years from Mr. Frits Johansen, of Ottawa, Canada. They were sent for the purpose of having them identified and returned for the National Museum there. Most of the collections were obtained in connection with summer expeditions for study and collection made by Mr. Johansen to various places, and included among others, James Bay, New Brunswick, Nova Scotia, Cape Breton Island, and Newfoundland. A new species of *Spongilla* from the vicinity of Shippigan, N.B. and specimens that seem to throw some light on

the relations between *Heteromeyenia ryderi* and *H. pictovensis* are of interest. Some additional data on the distribution of fresh-water sponges in the Canadian territory are also supplied. Preliminary to giving such data it seems advisable to make certain statements and explanations concerning some of the species involved.

The chief contributions to our knowledge of the Canadian forms were made by MacKay and Potts in papers published prior to 1890. Since that date but little has been added. Both of these authors included in *Meyenia* (=*Ephydatia*) *fluviatilis* forms that belong to two distinct species *Ephydatia fluviatilis* and *E. mülleri*. Waltner (Katalog und Verbreitung der bekannten Süsswasserschwämme, 1895) and recent students of the group have recognized the two species. Of these species, *Ephydatia mülleri* is the one usually found in the Canadian region, and is the one figured and described by MacKay as *Meyenia fluviatilis* in his highly useful paper of 1889 (Fresh-water Sponges of Canada and Newfoundland, Trans. Roy. Soc. Canada, Vol. 7, pp. 84-95).

Ephydatia fluviatilis has uniformly smooth skeletal spicules and the length of the shafts of the gemmule spicules is somewhat greater than the diameter of their rotules. The gemmule spicules form but a single layer about the gemmule. Specimens of *Ephydatia mülleri* exhibit a wide range of variation in the skeletal spicules which in some specimens may be smooth, in others rough, and in many specimens both smooth and rough spicules may occur in the same fascicles and in varying ratios. The shafts of the gemmule spicules are shorter than the diameter of the rotules. The gemmules may occur in a single layer or they may be arranged in two or more layers on a gemmule. Only the single layer arrangement has been noticed in the relatively small number of Canadian specimens examined by the writer.

The status of the form *Heteromeyenia pictovensis* has been a matter of difference of opinion among writers on the group. Potts regarded it as a distinct species in his original description (1885). Later (1887) he was convinced that it should be considered as a variety of *H. ryderi*. MacKay in 1889 presented arguments for considering it as a distinct species. Weltner (1895) treated it as a variety of *H. ryderi*. The chief difference between the two forms is found in the characteristics of the skeletal spicules. In *H. pictovensis* they are relatively much shorter and stouter than in *H. ryderi*. In the latter they are described by MacKay as "nearly 0.013 by 0.0006 inch, fusiform, spined except at the extremities." In *H. pictovensis* he described them as "0.0075 by 0.00075 inch. Short, robust, cylindrical, curved, with spines diverted towards the ends which may be round and spined or sharply conical." The texture of the sponge mass of this form is stated to be more compact. MacKay (1889) recorded *H. ryderi* only from Pictou County, Nova Scotia, while *H. pictovensis* is recorded by him from that and two other localities in Nova Scotia, and also in two localities in S.E. Newfoundland.

Among the collections from Mr. Johansen, *H. ryderi* is found in one from near St. Andrews N.B., in 1920 (E. E. Prince coll.); and in two collections from S.E. Newfoundland, one from the Collinet River in 1923 (A. English coll.) and the other from "ponds at sandpits", St. Johns in 1922. Specimens in a collection from the west side of Grand Lake in the western part of Newfoundland (1922) had most of the skeleton spicules like those normally present in *H. ryderi*, but there were also a considerable number of much shorter, blunter ones which are very similar to some of the longer spicules found in a specimen which is clearly of the *H. pictovensis* type in a collection from Quidi Vidi Lake, St. Johns, Newfoundland (1922). In view of the great variability in the skeletal spicules of *H. ryderi* it seems desirable to treat *H. pictovensis* as a variety of that species and designate it *H. ryderi pictovensis*.

Spongilla lacustris is another species in which much variability is found. In some specimens the gemmules are surrounded by a layer of considerable thickness in which the gemmule spicules are abundant and many of them assume a position nearly vertical to the gemmule wall. In many specimens the gemmule spicules are much fewer in number and lie tangential to the gemule surface in a much thinner layer of material than that which occurs in those first mentioned. The first type of gemmule spiculation is present in specimens of a collection (1920) from an island along the east coast of James Bay (about lat. 52° N.), while in the majority of the collections received the gemmules have relatively few spicules and they are mostly tangential to the gemmule surface.

Ephydatia mülleri is still another species in which the gemmule spicules exhibit much variability. In the variety *acuminata* Potts the shafts of the birotulate spicules are prolonged beyond the rotules in the form of pointed spines of varying lengths. They have the appearance of being abnormal but such specimens are commonly recognized as a variety.

The collections include *Spongilla lacustris* from the vicinity of St. Johns in Newfoundland (1922); Cape Breton Island (1917); vicinities of Bathurst

(1925); Dalhousie (1925); and St. Andrews[1] in New Brunswick; the Gatineau River[2]; James Bay (1920); and the vicinity of Ucluelet[3] in British Columbia. *Spongilla fragilis* from the Ottawa River (1921-24); and from a lake in Nova Scotia between Halifax and Windsor (1926). *Spongilla johanseni* n. sp. from the vicinity of Shippigan in New Brunswick (1925). *Ephydatia mülleri* from Cape Breton Island (1917), the vicinities of Bathurst (1925), Dalhousie (1925), and Shediac (1926) in New Brunswick, the vicinity of Ottawa (1921-24), and the variety *acuminata* from the vicinity of Ucluelet[2] in British Columbia. *Heteromeyenia ryderi* from the vicinity of St. Andrews[1] in New Brunswick, and from western and southeastern parts of Newfoundland (1922-23). The variety *H. ryderi pictovensis* from Quidi Vidi Lake in the vicinity of St. Johns in Newfoundland (1922). *Heteromeyenia repens*, recently changed to *H. baileyi* var. *repens*, is not included in MacKay's list, but is represented in a collection made at Truro, Nova Scotia, September 23, 1926. Gemmules were few in number, but sufficient for identification. "Pond below reservoir in Victoria Park" was a part of the inscription on the accompanying label. *Tubella pennsylvanica* recently included by European writers in the genus *Trochospongilla* is represented by specimens found in Quidi Vidi Lake in Newfoundland in 1922.

Spongilla johanseni n. sp.

Sponge forming a thin layer (1-2 mm.), without branches. Oscula inconspicuous and the soft parts of the sponge present a rather compact mass. Colonies examined were of several centimeters in diameter.

Skeleton structure limited almost wholly to vertical fibers or columns of spicules. Few of the fibers are branched, and very few of them are connected with others by transverse fibers. The fibers include abundant spongin and numerous skeleton spicules which are extremely slender. The fibers are attached separately to a thin, basal membrane which spreads over underlying gemmule masses or the substratum, when gemmules are absent. Many of the fibers extend to the surface membrane which is often raised into slight conical elevations at the place of contact.

Spicules of the different kinds are all very slender, straight, and have rather numerous small spines. The skeleton spicules are in part grouped in the vertical fibers or columns and in part distributed quite generally through the cellular mass and in the outer membranes. Fully developed ones average about .150×.0025 mm. No specialized flesh or dermal spicules have been recognized. Gemmule spicules are similar to the skeleton spicules, but the average length is only about three-fourths as great, the diameter at the middle is slightly greater; and the spines slightly longer than those of skeleton spicules.

Gemmules are abundant and are associated in groups each of which commonly includes 10 to 20 gemmules arranged in a single layer which is slightly concave on the side next to the substratum on which the sponge colony is borne. The foramina of the gemmules are usually borne on the side toward the substratum. The groups of gemmules are included between very thin membranes which separate them from the substratum on one side and from the main sponge mass on the other. Cellular parenchyma is undeveloped except in a very thin layer of flattened cells which spreads over the foraminal surface of the gemmules and covers less than half of the surface of each gemmule with its foramen as a center.

The material available for study consists of a few colonies preserved in alcohol which have been removed from a substratum of rotten wood. They were collected by Mr. F. Johansen in a "Tundra-lake on bog 4 miles west of Shippigan, N.B., September 9, 1925. (On submerged log.)"

Holotype and paratype in the collection of the National Museum in Ottawa, Canada, and paratype in the collection of the writer.

The sponge colonies are grayish white in colour as found in the preservative and form a thin layer of one to two millimeters in thickness. The surface is quite even except for the numerous slight elevations at the summits of the skeleton fibers and approximately a millimeter apart. The skeleton structure is conspicuously different from anything found in any other species seen by the writer. The careful removal of the soft cellular mass from between the vertical fibers without detaching the latter from the basal membrance leaves these fibers more or less crooked and widening out at the base where the spicules change from a parallel relation and diverge from each other as they come into relation with the basal membrane. The writer is reminded, while looking at these diminutive preparations, of a fire-swept timber area with only the bare tree trunks left standing, and these in part supported by the widening root systems at their bases. Measurements of 27 of these vertical fibers, selected from among the longer ones found, gave an average of 1.4×.035 mm. with only one attaining a length of 2mm. The maximum diameter found is about .055 mm. They are composed of an abundance of spongin in which

[1]Collected by Prof. E. E. Prince in August, 1920.
[2]Collected by J. Macoun in the summer of 1911.
[3]Collected by C. H. Young in the summer of 1909.

are imbedded large numbers of the extremely slender skeleton spicules. At any given level of a vertical fiber there are commonly 10 to 20 of these spicules as seen in an optical cross section. Probably a greater number than 20 occurs more frequently than a number below 10.

The diminutive size of the skeleton spicules is apparent when we consider that the length of the spicules is but approximately two-thirds as great as that found in some of our common species and that the diameter midway of the length is but one-third or one-fourth as great as that in most other species. The measurements of 18 among the longest of the spicules found in the new form average .155 × .0025 mm. Gemmule spicules are more nearly like the skeleton spicules than in most species. The lengths of 23 gemmule spicules averaged .112 mm. and the diameter midway of the length is .0025 to .003 mm. The spines are somewhat longer and the diminution in diameter of the spicule from the middle to the extremities is more gradual than in the skeleton spicules which are approximately cylindrical for a considerable part of their length.

The gemmules vary considerably in size and shape. A few are nearly spherical and in others the foraminal surface is somewhat flattened. The foraminal aperture is bordered by a flaring membrane reminding one of a shallow bowl with an opening in the bottom. Average measurements of 31 gemmules gave diameters of .3356 × .3648 mm. with minimum and maximum values found in different gemmules of a single cluster, .232 × .256 mm. and .400 × .424 mm. The diameter of the foraminal aperture averages about .03 mm.; the diameter of the bowl-shaped border is commonly .06 -.08 mm.; and its depth about one-fourth as great as the diameter. The thin layer that supposedly represents the cellular parenchyma shows plainly on the surface of the gemmule area of which the foramen is the center. In a surface view it shows a number of irregular polygonal areas that are commonly hexagonal but many have but four or five boundary lines in evidence. Many of them have diameters of .010 -.028 mm. The thickness of the layer is but a small fraction of the diameter of the polygonal areas and one naturally gets the impression of a thin layer of much flattened cells.

In the younger parts of the sponge colonies the gemmule clusters are more or less isolated, but in the older parts they are more crowded and their margins often in contact and in a few instances in places where the sponge mass is thickest there seems to be a tendency to form two layers of the flattened clusters.

Spongilla johanseni has a combination of characters which clearly differentiate it from any other North American species thus far known and from any species found elsewhere of which the writer has found a description. Slender spined skeleton spicules, absence of transverse skeleton fascicles, scarcity of gemmule spicules, the slightly developed cellular parenchyma, and the peculiar gemmule arrangement make a combination of characters that is quite distinctive.

THE BLACK-BILLED CUCKOO AND TENT CATERPILLAR

By SUSAN K. SQUIRES

EVERY so often one reads an article on our American Cuckoos and usually there is the suggestion that the species is parasitic. One would like to know just how often one of our Cuckoos lays an egg in another bird's nest or if the story is just a myth inherited with the name. Neltje Blanchan refuses to credit the idea in her book "Birds Every Child Should Know".

During the summer of 1921, the tent-caterpillars were quite plentiful in the trees around the house and a pair of Black-billed Cuckoos took up their abode in the orchard. I concluded that they had a nest somewhere, but I did not find it.

Then came the summer of 1922, and I never saw the tent-caterpillars so abundant, both apple tree and forest varieties. One walked on them and sat on them, found them on one's clothing, ran into their webs as they hung suspended from the trees, the very grass was full of them and they even began to get into the house. I wondered if the plagues of Egypt were much worse. The old apple trees were sprayed but nothing could be done for the shade trees, they were so numerous and so tall. By the time the caterpillars were half grown the trees began to look naked. A young beech grove was almost as open as in winter time. The poplars and choke-cherry bushes were stripped to the sticks. The maples and oaks were almost as bare but the more acrid leaves of the butternuts were rejected.

The pair of cuckoos came back on the 16th of May, and for two months I had the pleasure of watching them, every day and many times a day. They were above reproach, both as parents and as neighbours, and no two birds ever attended

more strictly to their own business. For a month they did nothing but gorge themselves and then sit motionless waiting for he food to digest so they could fill up again. They seemed to have a particular way of picking up the caterpillars, for sometimes they would catch one wrong, lay it down and pick it up again as if they were turning it round to swallow it right end first. After a time I became tired of watching them and wondered if they were not going to build a nest at all although I questioned where they would find the seclusion they require, everything was so stripped.

At last, on the 20th of June, a baseball was thrown and missed and it fell into the middle of a clump of syringa, growing on the lawn, about twenty-five feet from the kitchen door and one of the cuckoos flew out. Then I knew I had found the nest. The next morning I went round and round that bunch of bushes, for it was about ten feet through and heavy with blossoms. At last I saw the flat foundation of a nest, about five feet from me and level with my face. The birds had evidently been working in the early morning before I was about. In fact they were so secretive in their movements that I could hardly see them working when I was watching, for they went in and out of the bushes on the side away from the house.

After the nest was finished and incubation started, by the judicious use of the garden shears I could get within three feet of the sitting bird and look it in the eyes. It was good stuff, for it would sit motionless and watch me and didn't seem afraid. It didn't even leave the nest when the lawn mower was used close to the bushes. I was unable to distinguish the male from the female, so I couldn't tell which bird sat on the eggs or whether they both did, but I concluded that both did so for there always seemed to be a bird on the nest. They both carried food when the young birds were hatched, caterpillars and more caterpillars. Towards the last I even saw them tear the cocoons open and extract the pupæ. At first the birds were very careful how they left and approached the nest, gliding silently through white and purple lilac bushes and then into the open and vice versa, but it was not long before they were flying directly across the lawn and dropping into the centre of the clump of syringa.

Although I could not see into the nest, I could see the bill of one young bird turned up in the air and concluded that that was all there was. When it was nearly time for the youngster to leave the nest, I tried to take a photograph and I suppose frightened it for it hopped out on a branch and stayed there. This was at noon on a Friday and until Sunday noon it did not move more than two feet, sitting like a little image with its bill turned up in the air. It was not feathered out enough to fly much and was not an attractive little bird. At noon on Sunday one of the parent birds began to coax the youngster to a less conspicuous spot. It would fly before the baby and then call, and the small bird followed, hopping and taking little flights from bush to bush. I kept quite close for about forty feet, much to the distress of the old bird who tried several times to distract my attention from the young one. It would fly almost in front of me and then into an apple tree at a distance. At last the ruse succeeded for when I turned back to the young bird it had disappeared into a tangle of high-bush cranberries and black currants, overgrown with hop vines, an ideal place to hide in. The old bird joined it and croaked several times as if chuckling because it was so clever.

I went back to the nest intending to examine it, also to see if it contained any unhatched eggs. I pulled the bushes apart, stretched in my arm, put my fingers in the nest and they touched something warm and rough and a queer little stuttering noise greeted me. There was a second small bird in the nest. Then the other adult bird arrived with a caterpillar dangling from its bill and began to scold, so I got away. The second baby left the nest on the following Tuesday, and the family was reunited. For a couple of weeks I heard their calls from an almost impenetrable thicket of blackberries, red plums and cranberries which grew along an old stone fence on the upper side of the orchard. By that time the young ones could probably fly.

The nest was made almost entirely of the midribs of the compound black locust leaves with which the ground was littered. There did not seem to be any lining in it, and when I tried to separate it from the bushes it fell to pieces in my hand.

Meanwhile the caterpillars had quit feeding and had begun to crawl, hunting for places to spin their cocoons and some had already pupated. I watched one large mass and soon discovered that there was something wrong with it. Numbers of the grubs kept crawling up the tree trunk and joining the outside of the mass but none of them seemed able to get away again. When I examined them with a lens, I could see something like mold growing on them. I knew that this must be a fungus disease and that Dame Nature herself was taking a hand in the game. The caterpillars swelled up as if full of gas and then they all died. The ragged remains clung to the tree-trunk for a time, and then dried up and

dropped off. Few of those which pupated emerged as moths and the next spring there were very few egg masses to develop into cateprillars.

I did not see or hear the cuckoos in 1923, until the last week in June. As there was no plentiful food supply they did not stay to breed.

I have seen scarcely a tent-caterpillar since, until last summer (1929) and again I heard the cuckoos around quite frequently, so I am expecting both caterpillar and cuckoo for the summer of 1930.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

Ovibos moschatus (Zimm). MUSK-OX

(*Continued from page 162*)

PROBABLY the most gratifying work that we accomplished was the successful photographing of this famous ruminant, securing records, in the form of both still and motion pictures, depicting the animal in its natural habitat.

Within historic times these imposing animals gloried in a vast range that extended over the entire Northern Plains, but now the species in continental Canada is confined generally to the less accessible parts of this habitat.

During the past century their extirpation has chiefly been caused by the slaughter that has been wrought amongst them by natives and traders, who have sought to secure for the fur markets the valuable hides that are so well suited for use as robes. The fact of the animal's fearlessness has in great manner contributed to the wholesale slaughter to which it has been subjected.

The company's posts at which the majority of the skins used to be traded, before their destruction was prohibited, were Fort McPherson (from the eastern coast Eskimo), Forts Good Hope and Norman (from the Anderson Eskimo and from the post Indians who specially hunted them), Rae and Resolution, on Great Slave Lake (from Indian hunters), Lac du Brochet, Reindeer Lake (from the inland Eskimo), and Fort Churchill (from the Hudson's Bay Eskimo). During that period, hundreds of skins were exported annually from the Northwest Territories.

The measures that have now been enforced will doubtless go far to preserve the remainder of the great herds that used to roam the northern plains. But opinions adduced from my observations incline me to believe that the species is not numerically on the increase. The conclusion many will arrive at is that the wolf is responsible. I do not necessarily suggest that there has been a diminution in their numbers within the last twenty-five years, but after a careful comparison of facts as, fortunately, is made possible by a careful study of the data provided by the writings of Messrs. Hanbury and Tyrrell it would appear as though there were some influence rendering efforts at conservation somewhat abortive.

Although the musk-ox undoubtedly travels and roams the plains to some considerable extent, those that inhabit the more southerly portions of the range are given to retaining a preference for favoured "stamping grounds", and I doubt very much that those on Thelon River ever wander more than a few miles from such selected places, especially the bulls.

Edward Sabine first reported this animal from Melville Island. He says:

"This species . . . inhabits the North Georgia Islands in the summer months. . . . They arrived in Melville Island in the middle of May, crossing the ice from the southward, and quitted it on their return toward the end of September."

This is at variance with my conception of the habits of the continental animals.

Richardson of Franklin's first expedition states that—

"To the westward they are not seen in any numbers lower than latitude 67 degrees, although from portions of their skull and horns, which are occasionally found near the borders of Great Slave Lake, it is probable that they ranged at no very distant period over the whole country lying betwixt that great sheet of water and the Polar Sea. I have not heard of them being seen on the banks of the Mackenzie southward of Great Bear Lake, nor do they come to the southwestern end of that lake, although they exist in great numbers on its northeastern arm."

Thomas Simpson found them in large numbers about Dismal Lakes and between the Coppermine and Great Bear Lake.

Warburton Pike in 1889 also found them numerous near the source of the Coppermine River, north of Aylmer and Mackay Lakes, and on July 1st, 1890, a large herd consisting entirely of cows was seen near Sandy Bay, Aylmer Lake,

Anderson and Stewart in the summer of 1855 found them numerous along Back's River, and at Lake Franklin the Eskimos had constructed lodges made entirely of their hides.

Frank Russell found several bands between a point three days' travel east of the Coppermine and Bathurst Inlet. He was told by the Indians that these animals used to be found to the westward of the Coppermine, but that for five or six years hunters had been forced to penetrate farther from the wooded country into the Barren Lands to find them.

Caspar Whitney in March and April, 1895, found musk-oxen numerous at several points to the eastward of the Coppermine and to the northward of Point Lake, his party killing forty in two months.

A. J. Stone in the early spring of 1899 found musk-ox tracks to the southeast of Cape Lyon, or about three hundred miles east of the Mackenzie delta, but seeing no animals presumed that they had gone further inland in search of food. He says that about 80 were killed by whalers on Parry Peninsula in "97-98".

J. W. Tyrrell found a band of fifteen on Sifton Lake, headwaters of the Hanbury River, nine of which were shot. Later in the same year, 1900, he found the animals numerous all along Thelon River.

D. T. Hanbury when exploring Thelon River first found the tracks of musk-oxen numerous about thirty-five miles to the westward of its junction with the Dubawnt. On July 26th, 1901, he shot a musk-ox a short distance north of Artillery Lake, and remarks that many years before his coming the animals used to be numerous round the lake, but had since been killed off by the Indians, and when in 1896 he wished to procure specimens from the region was forced to travel twelve days from the timber to find them. He ascertained that musk-oxen were still to be found within a day's journey from Ogden Bay, inland. A large bull killed near the head of Dease River was found to have been living solely on willows and he mentions that he was of the opinion that the animal had not moved more than a mile from its secluded retreat, where it was shot, the whole winter.

Hubert Darrell, who was Hanbury's travellng companion, states that in his day musk-oxen ranged over most of the country as far south as latitude 63 degrees in the vicinity of Dubawnt, Campbell and Walmsley Lakes.

Macfarlane says that the musk-oxen were fairly numerous in the Anderson River region, entering the outer forest in winter time, and penetrating it for distances as great as a hundred miles. In the spring, he says, they advance northward.

John Hornby, who traded with the Indians of Great Bear Lake, and the Copper Eskimos in the country about old Fort Confidence from 1908-13, says that upwards of fifty musk-oxen were brought to him during the last three years of his residence there, these animals being shot at no great distance from the north shore of the lake. In 1922 he found a small band at Walmsley Lake but when we looked for them they had disappeared.

J. W. Tyrrell saw musk-ox robes "stacked by the Eskimo like haycocks" along the shore of Chesterfield Inlet, awaiting the opportunity to market them.

At Baker Lake I ascertained from an old Eskimo the fact that within comparatively recent years musk-oxen were killed in the country about Baker Lake and Chesterfield Inlet (north shore), but that now-a-days none was to be found anywhere in the surrounding country.

H. Ford, the Hudson's Bay Company's factor at the same place, told me also that quite recently he had heard that certain Eskimos had slaughtered a large band in the interior towrads Back's River.

The musk-ox is a gregarious animal, but is not migratory. If the band travels it is usually because of lack of food. They prefer to associate themselves with a certain chosen locality and remain there indefinitely. Further north, where grass and willows do not grow so profusely or so succulently as towards the southern limits of their range, it is reasonable to suppose that there is much more movement amongst them and that they are constantly forced to seek new feeding grounds; evidence shows that this is the case, although I am inclined to think that one or two writers might have been likely to believe that the movements observed by them were due to other causes as well. The periodical journeys south that those in the north make are without doubt for the purpose of securing the richer feed which is to be found within the shelter of the forest. The musk-ox has in his coat a downy wool that suffices to give him ample protection against the most fierce Arctic blizzard.

The musk-ox of the Arctic Islands is a subspecies of *Ovibos moschatus moschatus* of Boreal America, but the former appeared to Sabine to migrate whilst those on Thelon River remain on their stamping grounds. The reason is, I think, that those of Melville Island probably find that by moving southward better winter food can be procured. Those on Ellesmere land do not appear to migrate because they have a large

island over which to roam and by crossing the ice to the southward little would be gained. Individuals and occasional herds may change their haunts, but only by force of necessity.

Those that have been observed to make regular traverses of certain tracts of country may, then, be said either to possess a knowledge of good winter feeding grounds further south, or to have been forced to evacuate their usual range because of lack of fodder. The circumstances may seem similar but it will be seen that whereas the first might be said to be voluntary, the latter is undeniably involuntary.

The habitat of these animals existing to-day is practically unknown. Except for those surviving on the Thelon, I have heard of no bands having been observed on the mainland within recent years, excluding of course those killed on Back's River. Even G. H. Blanchet, who has made extensive explorations in the Treeless Plains during the past few years, and into the very heart of what was considered the musk-ox country, between Artillery Lake, the headwaters of Back's and the Coppermine Rivers, has seen but one animal representing the survivors in the district. This individual, probably a bull, was observed at the Narrows on Lake Clinton-Golden in the summer of 1924. The previous year, however, he saw the tracks of a cow and a calf that had been feeding on an island near the same place. It was not possible to ascertain in which direction these last had moved on leaving the island, but the former animal was seen in the distance travelling in an easterly direction, as though towards the Hanbury River. When he arrived with his Indians on Lake Clinton-Golden he was informed that musk-oxen might be seen at any time, and that thirty years previously two bulls had been killed on Casba River at the northern end of Artillery Lake. Evidence proving the truth of this statement was found by ourselves in the form of portions of a musk-ox skeleton lying near old axe cuttings in a clump of scrub spruce at the place described by G. H. Blanchet.

The evidence of H. Ford of Baker Lake gives one the impression that the inland Eskimo, who reside about the lakes on Back's River, and are so inaccessible as to render their control by the authorities a matter of great difficulty, must still be working in opposition to our attempts at conservation. This is a somewhat serious matter, because it appears that they are hardy travellers and well equipped with firearms, not at all loath to thrust out into the unknown. Living on a river, that flows through a region that is much favoured by these animals, they must constitute a grave source of danger to the species.

There seems to be not even an approximate knowledge of the numerical strength of the musk-ox, and although this information would be a valuable contribution to science it will be most difficult to make a guess with regard to the numbers forming the most valuable or accessible herds until aircraft is employed.

The characteristics of the musk-oxen are most interesting. As appealing to the æsthetic sense I think there is no more attractive animal and I have had the pleasure of observing big game in Asia, Africa, and Europe. I was particularly struck by the cleanliness of their range, although it was evident that several of the bulls we saw had occupied certain stamping grounds for a considerable period, moving for days on end not more than a few hundred yards, there was no sign of dung anywhere.

These animals were most numerous about Grassy Island on the Thelon River, and we saw between twenty-five and thirty within an area of four square miles.

Just below the last falls on Hanbury River, and on the south shore, nineteen were seen in two bands. The first numbering eleven, the second eight.

Upon every occasion when they were observed it was among the high willow beds that grow at frequent intervals along this route.

The first band was seen at midnight, July 19-20, 1925, the second at 8 a.m. They were brushing their way through a little clump of small spruce trees which grow beside a small unexplored river joining the main stream from the south-westward at that point. Growing in some profusion amidst the timber was a quantity of willow standing to a height of about four feet, matted and tangled like jungle undergrowth. Through this the animals were pushing backwards and forwards occasionally stopping to feed from the young shoots at the tops of the bushes. Their main object, however, seemed to be to rid themselves of the insect pests, which were extremely troublesome at just that time.

Two days later we found time to go in search of these bands, and taking with us our photographic apparatus proceeded to scour the woods and countryside for some considerable distance. But, although we found many well-worn trails testifying to the fact that the locality was much favoured by them, no animals were seen. In one clump of quite large timber, which is just above Helen's Falls, there were deep-cut trails that could but have been formed by much movement for many generations.

All these musk-oxen were seen on the south side of the river, and although I hunted for

tracks on the north side none was found at all. This was the only occasion on which a band was seen to the southward of our line of travel, though later on a solitary individual was observed on the south shore at a point seventy-five miles west of Beverly Lake, this being the last we saw.

The next occasion on which animals were met with was on July 27th, when three large bulls were observed on Grassy Island. Each of these had his own promenade, in each instance a small open grassy patch on the river bank about twenty yards long. Usually they were lying down, but every now and again they would get up and proceed to brush the flies from them by pushing through the twisted iron-stiff willows, which at this place were as high as eight feet. During the day we moved over and photographed the largest bull from a canoe.

The same evening having a little leisure we hunted out another large bull which was attempting to find a ford in the river, and watching him for a full hour provided us with much pleasure. Eventually he winded us when within but fifteen yards, and wheeling about rushed magnificently through the water to his stamping ground where he turned and tossing his head, bellowed at us defiantly.

I notice that in my diary I have described their movements when pacing the river bank "like policemen on their beats". I think now that it explains their action better than any lengthy descriptive writing can do.

That night (26th-27th) I spent preparing my motion picture apparatus, at two o'clock turned in, but I was awakened at three-thirty by Hornby calling and saying that fourteen musk-oxen were crossing the high sandstone hill five miles to the southwest, and were moving in our direction. Within a few minutes we were in a canoe and across the river. We took up a position on a prominent sand-dune and awaited their arrival. The sight was superb. Though so early the light was good with the sun up, and the animals glossy and almost black, showed up with a golden shot effect against the yellow of the sand. They were travelling fast in scattered formation covering an area of possibly four hundred square yards, one very large bull leading.

Now the previous evening on our return from photographing we saw a large bull stolidly walking in a southwesterly direction on the sand on the opposite side of the river to our camp. Hoping to get photographs of so splendid a specimen we hastened to paddle for the other side; the stream, however, was too strong to stem at speed, and we arrived at our high sand hill just after he had passed. Hoping still to secure records we ran after him, but he was moving at a fast swinging walk and our heavy packs seriously handicapped us. So we stopped, and there, on the open sand two hundred yards behind him, proceeded to howl, shout and make the most terrible noises of which we were capable in order to attract his attention. But nothing served to disturb his equanimity, and without deigning to favour us with so much as a single glance he strolled on, his long black robes swinging like kilts about him.

When next morning we saw so fine a bull leading this band, which consisted almost entirely of cows and calves, from exactly the same direction as that in which our bull of the previous evening had gone, we commenced to wonder, and although it was impossible to determine whether this was the identical bull that had been observed the previous evening, we felt inclined to believe that it was, and that possibly he had gone to bring to the more luxuriant vegetation about Grassy Island, the animals we had seen on the Hanbury River. This was considered quite possible as there seemed to be some resemblance between the two bands, each containing a similar complement of young individuals, four calves.

After watching them for some time and taking a few photographs, we saw two more crossing the sandstone hill, we walked to meet them, and several feet of valuable motion picture film were secured at close range. This band of sixteen consisted chiefly of young animals, mostly cows and except for the leader only two other male animals were seen amongst them, both of them being apparently two years old.

Later that day we endeavoured to discover where these animals had gone, but the country they frequent in this section is so heavily matted with sturdy willows, and also so swampy and alive with flies that after an hour or so of torment we desisted.

In the evening we proceeded down-stream, seeing and photographing two more large bulls.

On July 30th we found two bull musk-oxen lying in the undergrowth at a point on the north shore of Thelon River about forty miles from its confluence with the Hanbury. We crept on them and photographed them. This completed to our satisfaction, we felt that a little movement would be desirable. With us was a large white sleigh dog, part wolf and almost as large as one. After some exhortation we induced him to rush at the musk-oxen. Surprised for a moment they turned and ran, but after a few yards halted and the bigger of the two promptly lowered his head and charged the dog. The dog was ingloriously rout-

ed. This little scene I was fortunate enough to photograph kinematographically.

Thence onwards signs of the animals were frequently discerned, until when about a hundred and fifty miles down the river the last of the animals was left behind. Just at this time, however, we were considerably exhausted and it was with difficulty that we could travel the surrounding country at the conclusion of the day's work, hence it is reasonable to suppose that in the favourable places that are to be found further down the river a few more may live.

I see in the Report of the Royal Commission upon the Musk-ox and Reindeer industries of 1922, that witnesses testify to the animal's preference for grass as compared with willow, mosses and lichens. In the Thelon district I noticed particularly that a distinct preference is shown for the young shoots of the willow bushes, in fact I only once saw an instance when grass was eaten where willows abounded. Both willows and grasses grow luxuriantly for a considerable distance along the river's edge on either side of Grassy Island, the former attaining the height of ten feet. Amongst those at the thickest places the musk-oxen are most likely to be found, and rarely did we fail to find an animal if we sought them in the densest patches.

Our observations differ also with respect to the number of young animals seen in bands. The three bands seen by us were composed entirely of young animals, and the number of calves were in the proportion of 30%. I observe that many hold the opinion that cows breed only on alternate years; under ideal conditions, however, I believe they are more fecund than this.

With respect to flies I was careful to note that they suffer none of the torment that the caribou do; the ears are the parts most susceptible to attack and at times a considerable amount of discomfort attends this fact; however the musk-ox can flick these portions of his anatomy with the facility peculiar to a tiger, and this goes far to bring relief.

Another point which interested us considerably was the fact that about the musk-ox country there were fewer signs of wolves than anywhere else. The musk-ox is a much more agile creature than his appearance leads one to believe, and I doubt very much that he is subject to the attacks of wolves. Moreover, the young are so carefully watched by the cows that I doubt that wolves would ever have the opportunity or the time to despatch a calf before the arrival of the mother. Hornby is of the opinion that the Barren Ground Grizzly is responsible for depredations; this is quite possible although the bear is hardly a predatory animal.

It is evident that there are many musk-oxen in the region travelled by us, but it is impossible to arrive even at an approximate estimate of their numbers. Their habits are strange compared with those of other big game with which I have come in contact, and one might well pass through their country again without seeing more than an occasional bull.

The only way in which the matter can be satisfactorily investigated is from the air, and although it should receive serious contemplation the use of air-craft is still apparently regarded with much scepticism.

In the Thelon Valley there exists one of the most valuable and rare species of Canadian big game. It exists not only as the individual but in large numbers, residing in an area that comparatively speaking is both small and inaccessible. At the cost of a small initial outlay, less than the cost even of our expedition, the region could be surveyed, the number of the musk-oxen accurately determined, the value and extent of the timber in the valley arrived at, and, *en passant*, much done to determine the numerical strength of one of the largest migrating herds of wild caribou that annually, I feel convinced, frequents the district.

With regards to the conservation of the animal I shall deal later. That these animals are not more numerous than they were twenty years ago has not been proved by me here. It is left for the reader to compare statistics. Tyrrell never expressed in figures the number of the animals seen by him, but by reading between the lines and by studying his map, some conclusion may be arrived at.

That musk-oxen have been practically exterminated about the headwaters of the Coppermine and Back's Rivers seems fairly conclusively proved by the observations of G. H. Blanchet, and taking the species as a whole it may justly be said that its existence is in no little danger.

Rangifer arcticus (Richardson). BARREN GROUND CARIBOU

A great deal might be written concerning this famous animal, but as our investigations disclosed little or nothing more than is already known about them and their habits, facts that can be obtained by reading any of the better works on the North American fauna, I propose touching on the subject but lightly.

Although biologists have remarked that there

are perhaps two or more distinct species of these animals, seperated into such by the physiographic conditions of the country, so far as we are concerned, those on the mainland may be considered as one species. The different herds, or aggregations of herds, in continental Canada overlap during their migrations and at other periods, and probably those that we find moving in such dense numbers along Thelon River in July mix with the more northerly herds at the termination of their northward migration in May.

It was my intention to try and connect the movement of the caribou in our district with that of the herds further north, and for this reason I addressed letters to all the managers of the Hudson's Bay Company's posts along the Arctic coast asking them to keep a rough log of such movements in the vicinity of their respective establishments. No replies, however, have been forthcoming so my hopes of being able to compile a comprehensive account of the caribou movement throughout the year 1924-25 have been rendered abortive.

A tabulated account of the various movements as observed by us during that period is given here, however, and from that I believe a glance will show what occurred during the winter, and on the journey from Great Slave Lake to Hudson Bay.

The direction of the wind is given because it is generally held that caribou move against it. The extent to which they do will immediately be apparent, and as many instances disproving as proving the theory will be noticed; it shows that except for grazing herds having a tendency to face up wind when feeding, a gale will not cause caribou to move against it for any considerable distance. This is an interesting point when the possibility of domesticating the caribou is considered, in that there should be little difficulty in herding the animals during storms. Strong winds have been marked with a cross.

On September 13th, 1924, we first fell in with caribou on Artillery Lake at a point opposite Timber Bay. Most of those seen were bulls, and it would seem that they were moving in no particular direction, but merely feeding and putting on fat for the rutting season. Occasional cows and calves were observed, these also were feeding and appeared to be forming no part of a herd in the vicinity.

On September 29th it was observed that the bulls had formed into bands and were moving in bands of varying size from twelve to fifty and more. This continued, apparently, until about the 5th November. The bulls were still very fat on October 10th, but by October 17th, a distinct change had occurred and they were thinning fast.

On November 7th the first bull antlers were dropped, and by then the male animals had lost much of their strong odour. By November 19th they had practically all dropped their antlers.

On November 4th several hundred cow caribou were found bunched up on the western shore of Artillery Lake waiting for the ice to harden and allow them to pass north-eastward. This condition continued until the 9th when hunters moved up from the south and succeeded in driving the animals away from the lake edge to the northwest. By the 14th of November, however, more females arrived and in large numbers though usually in scattered formation, and continued to pass northwards throughout the entire winter.

Apparently the bulls continued with the cows until about November 21st, but from the 26th until December 9th the former were seen to be travelling south again in bands consisting usually of about fifteen individuals.

Young bulls from one to two years old were often seen moving with the cows during the winter, but from the end of January until May 5th, no full sized males were observed in the treeless country.

The cows commenced to drop their antlers on or about March 24th, most having fallen by the middle of April.

All the cows had passed northward by April 27th, and the northward migration of the bulls commenced immediately after this, the last of them having moved north of Hanbury River by June 20th.

On July 23rd at Grassy Island on Thelon River the main southward migration of the caribou was intercepted. They were moving, all sexes and new-born calves, in bands varying in size from 300–500 to 1000–2000. For two days they passed in this manner presenting a most imposing spectacle that once seen is never to be forgotten. During those two days and two nights when the movement was greatest many thousands must have passed along the banks of the river. At no time of the day or night would a walk to an elevation commanding an extended view of the country have failed to disclose the presence of numberless caribou. J. Hornby, who has assessed the number to pass us as 10,000, has, I consider, grossly underestimated their number. When first we saw them I hastened to my canoe and paddled with all the strength I could command to intercept them; I hunted them for an hour, we being entirely destitute of food, and I feel guilty of no exaggeration when asserting that within that time alone I saw fully five thousand

on the north bank and in the country further inland.

I do not feel inclined to hazard a guess as to their numbers, being content merely to remark that they were tremendous.

After the first two days the numbers lessened, but during the 30th and 31st scattered bands aggregating in all many hundreds if not thousands passed southward along the south bank and over the country further inland. These bands consisted more of bulls than had the previous herds, the reason probably being that, heavy with horns, the male animals are less inclined to travel at the high speed adopted by the females and their agile offspring.

There is a certain romance attending such a phenomenon, and the temptation is to wax eulogistic, but neither time nor space permit descriptive writing.

The summer of 1925 was somewhat remarkable for the large number of flies and mosquitoes, and in the Thelon valley they appear to be more troublesome than elsewhere, the nature of the valley is such that it must provide a veritable paradise for these pestiferous insects. From all appearances the size of the bands in which the caribou move, and their speed, is in no small degree regulated by the measure of success attending the efforts of these insects to attach themselves to the moving bands. As during this particular migration the animals were either moving down wind or transverse to it the flies no doubt experienced little difficulty in accomplishing their purpose.

Never were the caribou permitted to remain stationary or allowed to travel at a moderate or uniform speed. A band of several hundreds would be observed rounding a bend in the river bank, coming closely bunched and moving more often than not at a gallop. After five or six hundred yards, having, apparently, left the flies behind for a while, they would halt, some to graze, some to water, and a few to indulge in a short swim. A minute or so would constitute the length of such a halt, then suddenly they would become violently agitated and commence to jostle one another until the leaders started southward again. The leaders would commence moving at a quiet amble, but pressure from behind invariably caused them to break into a gallop for another few hundred yards, when, apparently, another rest would, by common consent, be favoured. Fortunately such interesting habits we were able to record kinematographically. Pictures, however, never adequately describe such scenes, and even more astounding than the actual massed movements of such large numbers of deer, is the great noise attending such movements—the thunder of so many hoofs, and the hoarse calls of the mothers and calves combining to swell into such a volume of sound that it might be mistaken at the distance of a mile for the roar of some great fall of water.

Amongst these bands, which for the great part were composed of females and young, occurred several males. These bulls gave the impression of being the fittest representatives of their sex, they were all young animals, few it would seem being over four years old. Without exception they had changed their winter coats, unlike some of the older animals of the same sex that straggled southward in the rear of the procession.

The females, however, still retained much of their old hair and presented a most sorry appearance, the young resembling their mothers.

As we travelled eastward stragglers were constantly met with and usually they were either yearling bulls, or odd sickly cows with their calves.

In the delta of Dubawnt River there are many islands and on the larger of these, several falling within this latter category were noted, possibly six to an island and fifty over the whole delta. Here we noted what appeared to be a yearling cow with a calf. We did not shoot the poor animal owing to the fact that we had neither any use for such poor meat as she would provide, nor would a post mortem examination have revealed to us much more than we actually saw, we being enabled, by careful stalking, to creep within a few feet of them. The fact was hardly to be credited, but we both considered that there was little room for doubt in the matter.

On August 24th the first band of animals, untroubled with flies and quietly grazing, was observed, eleven cows and calves, having settled down apparently to roaming for pasture. A two and a half year old bull killed on August 22nd was found to be putting on fat, a third of a pound being taken in one piece from above the rump.

By September the female animals had again massed up, and during the first few days of that month many hundreds were slaughtered in the vicinity of the mouth of Thelon-Dubawnt river by Eskimos. On September 5th about half way down Baker Lake, on the southern shore, several bands of fifty to a hundred individuals in each band were seen, they being the last animals observed by us on the trip.

Date	Location	Direction of Movement	Numbers	Sex	Wind	
Sept. 13	Artillery Lake	No direction	6, very scattered	Bulls	SW.	x
16	Artillery Lake	Scattered	Several	All sexes	SW.	
17	South of Artillery Lake	Scattered	Several	All sexes	W.	x
18	South of Artillery Lake					x
28						
29	North of Artillery Lake	NE	35	? (Bulls)	SSW.	x
Oct. 1	North of Artillery Lake	N	Small band	?	NNE.	x
2	North of Artillery Lake	N	An occasional bull		S.	x
5	North of Artillery Lake	NW	Two bands of 12	Two bulls, calves and cows	SSW.	
9	North of Artillery Lake	E	Several tracks	Cows and calves	W.	x
10	North of Artillery Lake	N	50	Bulls in two bands		x
17	North of Artillery Lake	SW	50	Bulls and cows	SE.	x
18	North of Artillery Lake	N	Several tracks	?	N.	
Nov. 1	Casba River	S	1	Bull	S.	x
3	North of Artillery Lake	S	8	One bull leading cows and calves	W.	x
4-9	Last Woods, N. of Artillery Lake	NE	Several hundred	Principally cows and calves	SW.	x
13	North of Artillery Lake	N	3	Cows and calves	SW-N.	x
14	North of Artillery Lake	N	Three bands of 15	Cows and calves	NNE.	
15	North of Artillery Lake	N	5	One yearling bull, cows and calves	S-N.	
16	North of Artillery Lake	N	200-300 in scattered bands of 7	Cows, calves and yearling bulls	SE.	
19	North of Artillery Lake	N	7	Bulls	ESE.	x
21	North of Artillery Lake	N	Numerous	Cows and calves	NE.	
Nov. 26	North of Artillery Lake	SSE	15 (1 band)	Bulls	WNW.	x
28	North of Artillery Lake	SW	17 (1 band)	Bulls	ESE.	x
29	North of Artillery Lake	S	12 (1 band)	Bulls	ESE.	x
30	North of Artillery Lake	S	Several small bands	Bulls	ESE.	x
Dec. 4	North of Artillery Lake	Grazing	15 (1 band)	Bulls	W & N & W	
5	North of Artillery Lake	Moving aimlessly	Small	Bulls	W.	
7	North of Artillery Lake	"	Numerous	Cows and bulls	SW & W.	x
9	North of Artillery Lake	"	9	Bulls	S.	x
11	Casba River	"	Fairly numerous	Cows and calves chiefly	N.	x
13	Casba River	ENE	300	Cows and calves chiefly	WNW.	x
14	Casba River	ENE	Numerous	Cows and calves chiefly	NW.	x
15	Casba River	ENE	51	Chiefly cows and calves	NW.	x
17	Casba River	E	5	Bulls	NE.	x
26	Casba River	N	3	Cows and 2 calves	NW.	x
28	Casba River	S	2	Cows	NNW.	x
30	Artillery Lake	N	3	1 bull, cows and calves	W.	x
Jan. (?)	Artillery Lake	S	2	Cow and calf	E.	
6	Artillery Lake	Wandering	2	Bulls	N.	
11	Artillery Lake	N	Tracks	Cows and calves	SSW.	
12	Artillery Lake	N	Tracks	Cows and calves	SSW.	
13	Artillery Lake	N	Tracks	Cows and calves	W.	
14	Artillery Lake	N	Tracks	Cows and calves	SW.	
22	Artillery Lake	W	4 small	Bulls, cows and calves	N & E.	
25	Artillery Lake	S	4	Bulls	S.	
26	Artillery Lake	Grazing	6	Bulls	N.	
30	Artillery Lake	W	1	Cow	W.	x
31	Artillery Lake	SE	11	Two yearling bulls, cows and calves	W.	x
Feb. 2	Artillery Lake	SE	18 (4 bands)	Cows and calves	N.	
5	Casba River	W	5	Cows	E.	
10	Casba River	E ?	3	Cows	E.	
12	Casba River	S (when disturbed)	9	Cows and calves	N.	x
21	Casba River	ENE	12	Cows and calves	WNW.	
22	Casba River	NE	Tracks plentiful	Cows and calves	SSW.	
25	Casba River	S & N	Tracks	Cows and calves	NNW.	x
26	Casba River	N & W	15	Cows and calves	NNW.	
28	Casba River	E	30	Cows (no calves ?)	NNW.	
March 1	Artillery Lake	E	Fairly numerous	Chiefly cows and calves	E.	
3	Casba River	E & S	Odd couples	Cows and calves	N.	
6	Casba River	S	Tracks plentiful	Cows and calves	SE.	

Date	Location	Direction of Movement	Numbers	Sex	Wind	
March 9	Casba River	SE	16 (in 4 bands) 25 (1 band)	Bulls, cows and calves	NE.	
15	Casba River	E & SE	30	Cows and calves	NNE.	x
16	Artillery Lake	Grazing	Plentiful	Cows and calves	W.	x
19	Casba River	N. (straggling)	40-50	Bulls, cows and calves	W.	x
20	Casba River	SE	15-20	Bulls, cows and calves	S.	
21	Casba River	NNW	20	Cows	N.	x
22	Casba River	NNW	20	Cows	SSE.	x
24	Casba River	NE	70-80	Young bulls, cows and calves	NNW.	x
25	Casba River	N	40-50	Young bulls, cows & calves	W.	x
26	Casba River	NNE	200-300	Young bulls, cows & calves	N.	x
27	Casba River	SSE	7	Young bulls, cows & calves	SE.	x
30	Casba River	E	Fairly numerous	?	NE.	x
31	Casba River	ENE	Tracks numerous	Cows and calves	NNE.	x
April 1	Casba River	ENE	Tracks numerous	Cows and calves	WSW.	x
5	Casba River	E	9	Cows and calves	E.	
8	Casba River	E	Hundreds (bands of 25)	Cows and calves	W.	x
9	Casba River	E	Hundreds (bands of 25)	Cows and calves	N.	
10	Casba River	E	Hundreds (bands of 25)	Cows and calves	S.	
11	Casba River	E	Hundreds (bands of 25)	Cows and calves	N.	
13	Casba River	E	Hundreds (bands of 25)	Cows and calves	W.	x
15	Casba River	E	Hundreds (bands of 25)	Cows and calves	WNW.	
16	Casba River	E	Hundreds (bands of 25)	Cows and Calves	N.	
20	Pike's Portage	E	Numerous	Cows and calves	SSE.	
21	Pike's Portage	NE	Numerous	Cows and calves	NNE.	x
27	Pike's Portage	E	Numerous	Cows and Calves	E.	x
May 5	Casba River	N	20	Bulls	SE.	
7	Casba River	N (E)	15	Bulls	S.	
8	Casba River	NW	9	Bulls	NE.	x
10	Casba River	N ?	17	Bulls	E.	
19	Casba River	NW	11	Bulls	E.	
22	Casba River	NW	A few	Bulls ?	E.	x
23	Casba River	SW	A few	Bulls	SW.	x
25	Campbell Lake	E	60	Bulls	SW.	
26	Campbell Lake	N	40	Bulls	NE.	
27	Campbell Lake	N	8	Bulls	NE.	
29	Campbell Lake	N	8	Bulls	NNE.	
30	Campbell Lake	N	11	Bulls	NNE.	
June 3	Campbell Lake	Wandering	A few	Bulls	SE.	
4	Campbell Lake	N	40	Bulls	NE.	
5	Hanbury River	N	About 100	Bulls	NE.	
7	Hanbury River	N	20	Bulls	E.	x
10	Hanbury River	N	A few	Bulls	NW.	
12	Hanbury River	N	A few	Bulls	ESE.	
13	Hanbury River	N	A few	Bulls	E.	
14	Hanbury River	N	A few	Bulls	SE.	x
17	Hanbury River	N	4	Bulls	N.	x
18	Hanbury River	N	8	Bulls	W.	
19	Hanbury River	N	3	Bulls	W.	
20	Hanbury River	N	8	Bulls	W.	x
July 2	Hanbury River	Wandering aimlessly	1	Bulls	E.	x
6	Hanbury River	Wandering aimlessly	An occasional bull	Bulls	ENE.	
8	Hanbury River	Wandering aimlessly	1	Bulls	E.	
23	Thelon River	S	Thousands	All sexes	NW.	
24	Thelon River	S	Thousands	All sexes	NW.	
27	Thelon River	S	Less numerous	All sexes	NE.	
28	Thelon River	S	Numerous again	All sexes	SW.	
31	Thelon River	S	A few stragglers	All sexes	W.	
Aug. 1	Thelon River	S	A few stragglers	All sexes	W.	x
2	Thelon River	S	A few stragglers	All sexes	E.	x
3	Thelon River	S	A few stragglers	All sexes	E.	x
8	Thelon River	Wandering aimlessly	A few stragglers	All sexes	NE.	

Date	Location	Direction of Movement	Numbers	Sex	Wind	
Aug. 11	Thelon River	Wandering aimlessly	A few	Cows and calves	E.	x
15	Thelon River	Wandering aimlessly	A few	Cows and calves	NNW.	x
18	Thelon River	Wandering aimlessly	3	Cows and calves	E.	x
20	Thelon River	Wandering aimlessly	A few	Cows and calves	E.	
22	Thelon River	Wandering aimlessly	1	Bulls	SW.	x
24	Thelon River	Wandering aimlessly	11	Cows and calves	WNW.	
25	Thelon River	Wandering aimlessly	A few	Cows and calves	NNW.	
26	Thelon River	Wandering aimlessly	Several	Cows and calves	NNE.	
Sept. 6	Baker Lake Station	?	About 500	Cows and calves	W.	

x Indicates strong wind

(To be continued)

EDWARD ARNOLD

EDWARD ARNOLD, an Associate of the A.O.U. since 1894, died January 2, 1930, at his home in Montreal, Quebec, Canada, in his 66th year. He was born at Kingston, Ontario, on August 26, 1864, and at the time of his death had seen nearly fifty years of railway service, filling various positions until finally appointed Auditor of Freight Claims, with jurisdiction over the whole of the Canadian National System. He was also an active member of the American Railway Association, Claims Section, having been Chairman of the Association, a position at the head of railway claims affairs on this continent, which was an appreciation of his railway work and value. He was generally considered quiet, unassuming and retiring in his manner, strong in his convictions, loyal to his friends and dependable at all times. He had been interested in birds all his life, and travelling about as he had to do in his various railway capacities gave him the opportunity of studying birds from the Atlantic to the Pacific. He was a fearless climber and his large collection of eggs representing over a thousand species and sub-species was well known among collectors. In addition to this collection, he had a small one of skins and mounted specimens of birds, as well as a much larger one of postage stamps which he had started as a boy, and to which he had paid especial attention during his later years, when strenuous outdoor work had to be abandoned owing to ill health. He had acquired, also, a small but valuable library, numbering many rare editions, not only in ornithology, but in examples of modern critical and biographical essays and works. In addition to being an Associate Member of the Union, he was a Member of the Cooper Ornithological Club, the Canadian Field-Naturalists' Club, and a late Member of the Province of Quebec Society for the Protection of Birds. He came to reside permanently in Montreal in April, 1908, and is survived by his wife, Altabella Simons Arnold, and one daughter, Carolyn.—H. MOUSLEY (*The Auk*, 47 : 457).

NOTES AND OBSERVATIONS

AN EARLY LAKE ERIE SEICHE RECORD.—Largely out of curiosity the writer has examined each of the four text books on geology in his library in order to ascertain how many of them give a description of the phenomenon known as a *seiche*. Only one of these mentions or refers to this curious phenomenon. Since a seven volume dictionary examined also fails to include the word seiche the writer ventures to preface this paper with a definition of the term quoted from Professor Grabau[1] who discusses this subject

[1]Grabau, A. W., *Principles of Stratigraphy*, 1913, p. 230.

under the general head of tides as follows:

"In large lakes a periodic rise and fall of the water of slight extent has been observed and compared with the tides. These lake tides are very small, that of Lake Michigan, for example, having an interval of only 2 inches. More irregular oscillations of the entire water body of lakes are found in the seiches, which are due to some disturbance of the water as a whole, as in the case of sudden barometric changes, in storms, etc., and may be compared to the oscillation of the water in a basin which has been lifted on one side and suddenly dropped. Such oscillations will continue for some time after the cessation of the disturbing force."

The seiche is a phenomenon which appears to recur as rarely or perhaps more rarely than earthquake phenomena, and the two are equally unpredictable. The writer has made enquiries concerning such phenomena of many persons living near the Great Lakes who might be expected to have had opportunities to observe a seiche but has encountered only one individual who has personal knowledge of seiche phenomena. It appears therefore worth while to call attention in *The Canadian Field-Naturalist* to a seiche record of unusual interest which though published long ago[1] has probably come to the notice of very few naturalists. This record occurs in the Journal of Capt. Thomas Morris, who had a wide experience in various Indian wars on the American frontier, in the second half of the eighteenth century.

Captain Morris was instrumental in causing General Bradstreet's army to make a hasty retreat down the Sandusky river where hostile Indians had planned to encircle amd ambush the troops. The surprising reception which the troopers met with from the waters of Lake Erie however probably led them to wish they had met the tomahawks instead of the wave which swamped their boats on the shore of Lake Erie. Capt. Morris[2] describes what occurred as follows:

"This army however suffered extremely afterwards, and great numbers were lost in traversing the desert, many of their boats having in the night been dashed to pieces against the shore, while the soldiers were in their tents. The boats were unfortunately too large to be drawn out of the water. The sentinels gave the alarm on finding the sudden swell of the lake, but after infinite labour, from the loss of boats, a large body of men were obliged to attempt to reach Fort Niagara by land, many of whom perished. It is worthy of remark, that, during this violent swell of the waters, soldiers stood on the shore with lighted candles, not a breath of wind being perceived. This phænomenon often happens."

This experience on a calm summer evening in 1764 must have convinced General Bradstreet that he was indeed "between the Devil and the deep sea". It is clear from the observation, "not a breath of wind being perceived", that the destruction of the boats was wrought by a seiche. But the writer questions the statement that "this phenomenon often happens", though no doubt Morris had been told of other examples of it.

Examples of the seiche which have been observed by persons having opportunities to note this phenomenon would, if reported in *The Canadian Field-Naturalist*, aid in determining what degree of frequency this curious and not well understood phenomenon has.—E. M. KINDLE.

THE INCREASE AND PRESENT STATUS OF THE STARLING AT TORONTO, 1930.—Since the appearance of our previous note under a smiilar title[1] the status of the Starling (*Sturnus vulgaris*) has changed sufficiently to be worthy of record. Up to the spring of 1925 the species had spread from the south and west and had established itself in the outskirts on all sides of the city. It had been noted as having encroached slightly on the city proper but as a nesting species it was apparently limited at that time to the outlying territory.

The first appearance of the Starling in the more central parts of the city was in the winter of 1925-26 when a few regularly frequented backyards on Delaware Avenue. There were no reports of the species nesting within the city during the summer of 1926, the nearest approaches being at Grenadier Pond and Cedarvale. During the fall of that year and the winter of 1926-27 small flocks were noted about Exhibition Park and near-central districts such as Howland Avenue.

On March 31, 1927, the first record for the center of the city was made when a pair was seen by Professor T. F. McIlwraith at Queen's Park. During that spring and summer (1927) pairs were noted as nesting in sections well within the city —Parkdale station, Queen's park, Spadina Avenue and Rosedale. During the winter of 1927-28 Starlings were noted regularly by local naturalists about and within the city but it was not until the spring of 1928 that they became noticeable to the casual observer. Pairs were to be found nesting, scattered throughout the residential sections (excepting the more central parts) during that spring and summer. They invaded bird-boxes about homes, sought out crevices in buildings and

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[1]Captain Thomas Morris, *Miscellanies in Prose and Verse* (London, 1791), pp. 1-39.
This has been republished with other journals in *Early Western Travels, 1748-1846*, 1 : 295-328. *Journal of Captain Thomas Morris, of His Majesty's XVII Regiment of Infantry; Detroit, Sept. 25, 1764.*

[2]*Journal of Captain Thomas Morris, of His Majesty's XVII Regiment of Infantry; Detroit, September 25, 1764*, p. 326. Published in *Early Western Travels*, Vol. I, (1904).

[1]*Can. Field-Nat.*, 39 : 149-50, 1925.

took possession of woodpecker holes, etc.

In August and September, 1928, a large congregation of Starlings nightly invaded a section of Lawrence Park to roost. During the following winter, 1928-29, the species did not appear to spread much but in the spring of 1929 there appeared to be a slight spreading out, within the territory already occupied in a general way. Birds re-appeared at nesting sites inhabited the previous year and new localities were invaded.

In the early fall of this year (1929) Starlings again congrgeated to roost at Lawrence Park. The roost was in a small poplar wood approximately one acre in extent. Starlings, Cowbirds and a few Grackles resorted there in such numbers as to create a nuisance to local residents. On September 3 the roost was visited (by T.F.M. and J.L.B.) and at about 6 p.m. the birds started to come in large, specific flocks. They mingled in the trees and their loud chattering made a constant din which was almost deafening. By 6.40 p.m. the flocks were apparently all gathered together and an estimate of 10,000 birds was computed, approximately fifty per cent of which were Starlings. Local residents had to take special measures to protect their trees and lawns and, at times, during wet weather, the stench from the excrement beneath the roost was objectionable. Attempts were made by city officials to discourage the roosting of these birds in Lawrence Park but they were unsuccessful.

The winter of 1929-30 stands distinctly as a milestone in the local spread and increase of the Starling. Pairs which had nested in central areas remained there for the winter, not disappearing as in previous years. They became a bird of the city's streets and backyards. Inquiries received from all parts of the city concerned Starlings. Only the noisy, down-town business blocks are yet to be invaded, and even there occasionally, individuals are seen.

In tracing the local spread of the Starling it seems that the searching out of nesting sites in late winter and early spring results in the dispersal of the species. In a small way new territory is invaded and observations during the past winter indicate that this new territory is held during the winter months when subsistence is available. In some instances the species was first observed in new territory in fall or winter but it might be supposed that their appearance in flocks at that time made them more conspicuous, they having been overlooked when present in scattered pairs.

In our previous note we made mention of such material concerning the species as had been brought together in local scientific collections up to 1925. S. L. Thompson has recorded[2] the first set of eggs (May 4, 1926), this set being in his private collection. Many sets have since been collected. The Museum possesses a large series of skins of the Starling mostly collected during the prosecution of the work carried on by Dr. H. F. Lewis[3]. Specimens are also to be found in the collections of private individuals in the Toronto region.—L. L. SNYDER and J. L. BAILLIE, JR., *Royal Ontario Museum of Zoology, Toronto.*

EUROPEAN STARLING.—In connection with Mr. W. Baillargé's article in the previous number of *The Canadian Field-Naturalist* relative to European Starlings being first seen in Rivière du Loup in April, 1929, I should like to add that in the summer of 1928 a pair were nesting in a hole in a telegraph post in front of my father's property at St. Patricks, about four miles west of Rivière du Loup. The same summer I saw three or four of them near the station at Rivière du Loup, and several near the church at Cacouna. I am just mentioning this to complete Mr. Baillargé's record.—R. MEREDITH.

GROUNDHOG ACTIVE IN WINTER.—On January 4, 1930, I shot a groundhog near Orton, Dufferin County, Ontario. At the time it was killed (2 p.m.) this animal was about fifty feet from the entrance to its burrow and was feeding on sweet clover leaves, a few of which were found in its stomach.

For several days previous to the appearance of this animal the weather had been quite mild and most of the snow had disappeared. The burrow near which the specimen was found was situated in sandy soil on quite a steep hillside. The weather on the day in question was quite cold but sunny.

Whether the groundhog had been forced from its burrow by water from melting snow running into it or whether the mild weather had induced a voluntary appearance, is not known. Examination of the viscera and other parts of the animal showed it to be quite fat and apparently in a healthy condition. When alarmed, it did not move as quickly towards its burrow as is usual in summer specimens and this, together with the fact that when shot, there was no quiver or other movement by the body such as is usually seen in animals so killed, suggests that it was still in a partially torpid condition.

The observation indicates that under certain conditions the groundhog may become active during winter.—E. R. S. HALL.

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[2] *Can. Field-Nat.*, 40 : 141-42, 1926.
[3] *Univ. of Tor., Biol. Series*, No. 30, p. 32, 1927.

THE EUROPEAN HARE AT MEAFORD.—The following records are of interest in connection with the spread of the European hare.

Mr. L. H. Beamer reports that these hares were first seen in Meaford, Gray County, in the winter of 1927-28, when a pair was seen at intervals throughout the winter in the vicinity of a brickyard half-way between Meaford and Thornbury.

Mr. W. J. Linn, who lives about 10 miles north of Meaford, reports having seen the European hare for the first time in his neighbourhood about July 20, 1929, when he found a nest containing six young ones.—J. R. DYMOND.

BOOK REVIEW

A FAUNAL INVESTIGATION OF SOUTHERN BAFFINLAND. *By J. D. Soper. This volume comes as Bulletin 53, Biological Series No. 15, from the National Museum of Canada. 129 pages, with 14 plates and a very poor map.*

Containing the results of the author's work during the summer of 1923, and of the period from July 22nd, 1924, to the fall of 1926, when he returned to the south. While Mr. Soper's time was very fully occupied in making collections and taking notes on every conceivable form of Natural Science, his chief attention was paid to Ornithology and Mammalogy. At those times when there was little to be done in these lines, such as the darkness of winter, much of exploration and mapping was accomplished, and a very great deal was added to our knowledge of Baffinland. The expedition of 1924-26 realized two whole summers on the Island, the first part of which was spent mainly near Nettilling Lake, and we are given interesting glimpses of the climate in the interior. Thus, the ice on Nettilling Lake was available for travel until early in July and by June 20th "three-quarters of the country was free of snow".

The summer climate appears to have been delightful, the temperatures being given for July as 52 degrees average at 8 a.m., with a maximum at midday of about 74, but snow began to fall in late August, and through most of that month the higher elevations were covered.

After the lake became open, it was circumnavigated, and the entrances to the two rivers, Amadjuak near the south end and Koukjuak about halfway up on the west side, were explored for short distances.

The first sledging journey to Nettilling Lake was commenced on April 22nd, 1925, and after severe labour, and many mishaps, such as having the boat and the sledges get stuck in the snow, and so forth, the eastern extremity of the lake was reached on May 5th. The remainder of that month was tempestuous, and not until June 8th did patches of tundra become free from snow, the morning temperature gradually becoming higher, reaching the maximum for the month on the 27th, 60° at 8 o'clock in the morning. The last snowstorm occurred on June 17th and the first rain on June 18th, marking the onset of Spring, which came so rapidly as to clear the snow from most of the land by June 20th.

It was nearly eight weeks later, however, that the waters of Nettilling Lake became free of ice, so that it could be explored; and on August 10th the party of six started to circumnavigate it, and passing along its north and west shores, the river Koukjuak, which empties the lake, was entered on August 22nd. This river was descended for some miles and then a return was made to the base camp, which was reached on September 9th. Occasional snows had been falling for two weeks, so the boat and the collections were left at the base camp until winter should provide feasible travelling, and the party returned to Pangnirtung.

In January a trip was made across Baffin Island, Foxe Basin being reached immediately north of the Koukjuak River on January 31st, and after some exploration, a return to the Post at Pangnirtung was accomplished on February 15th.

During the following Spring Mr. Soper made a journey to Cape Dorset on the southwest shore of Baffin Island, where the summer was spent, and he returned to Ottawa via Amadjuak Bay and Port Burwell in the fall of 1926

The scientific part of the book is well done. There is a list of twenty-five mammals, eleven of which are terrestrial and fourteen aquatic, including six seals and eight whales and whale allies. The list is fully annotated, and forms a real addition to the available knowledge of the mammalian fauna of Baffin Island.

Eighty-five species of birds are listed, of which a little less than one half are indicated as breeding on Baffin Island. A good many of the breeding records are those of Kumlien, who worked there in 1879, and it is quite possible that changes have occurred since then. Of the eighty-five species, there are twenty-eight seabirds, fifteen ducks, geese and swans, two cranes, eighteen waders, two ptarmigan, eight raptores, eight sparrows, Hoyt's Horned Lark, Pipit, Wheatear and the Raven.

There are also list of Fishes, Insects, Pterpoda and Fungi, but the botanical results are reserved for a later publication.

This is a most readable volume for all those interested in Nature as it appears in our northern regions, and adds very much to our previous knowledge of the fauna of Baffin Island.

It is regrettable that, in so good a volume, the map should fall so lamentably short. In two out of the three copies that this reviewer has examined, it is inserted upside down, and the style of the map itself leaves almost everything to be desired. The legends indicating the explorations of the author, and of previous explorers, three legends in all, are so nearly alike that they are exceedingly difficult, if not impossible, to follow, and the lines used as boundaries resemble the route marks so closely that the map is rendered nearly useless as a guide to the movements of the explorer. Moreover, the names of most of the localities mentioned by the author do not appear on the map; and if a map has any purpose at all, surely it is to identify and define localities where explorations were made, and scientific results were attained. A desire to conserve public funds is laudable, but in this instance it has undoubtedly been carried too far, and has militated seriously against the very purpose of the publication in question.—W.E.S.

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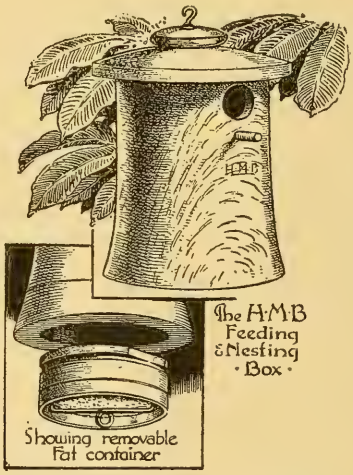

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THE RATTLESNAKE (Sistrurus catenatus) IN ONTARIO

By W. J. LeRAY

ALTHOUGH the Rattlesnake (*Sistrurus catenatus*) has been exterminated over the greater portion of its range in the Province of Ontario, there are still large areas in widely separated districts, where, owing to conditions offering almost complete protection, it persists, and in some parts where there are abundant places of concealment it is still numerous.

The present range of this rattlesnake in Ontario includes Bruce peninsula, the Georgian bay district at least as far north as the French river and a large peat bog near Wainfleet, Welland county. Specimens from all of these localities have been secured by the writer.

This species, generally called Massasauga, is often referred to as the Prairie Rattlesnake in Ontario, but the latter title is misleading and tends to confuse it with another species (*Crotalus confluentus*) of the western plains.

The Massasauga is believed to be the only species of rattlesnake now occuring in Ontario. The Timber Rattlesnake (*Crotalus horridus*), a larger and more dangerous species, apparently common enough when the country was first settled, has not been reported for a number of years and is now believed to be extinct here although it is still abundant in the mountainous districts of New York, Massachusetts, and more southern parts of its range.

The rattlesnakes are divided into two genera—*Sistrurus*, the Ground Rattlesnakes or Pigmy Rattlesnakes and *Crotalus*, which embraces the rattlesnakes proper. These may be distinguished as follows:

Top of head with large symmetrical shields, size small. Genus *Sistrurus*.

Top of head with granular scales, species both large and small. Genus *Crotalus*.

A small rattlesnake is one that attains a length of not more than a yard. The large species reach a length of six to eight feet.

The Massasauga is of very small size as compared with the average rattlesnake and may at once be distinguished from other rattlers by the peculiar scalation of the top of the head. The head is covered with large shields arranged like those of the harmless snakes but may be told at a glance from the latter by the unique caudal appendage—the rattle.

Because of its resemblance in structural characters and food habits to *Agkistrodon* (Copperhead and Water Moccasin of the south), the genus *Sistrurus* is believed by herpetologists to be a direct offshoot of *Agkistrodon*, an evolutionary branch independent of the larger and more highly specialized rattlesnakes (*Crotalus*).

During a collecting trip in Bruce peninsula, in the summer of 1927 the writer found the Massasauga to be very common. During two months' hunting thirty-five living examples were taken and many others that had been killed by tourists and fishing parties were examined. Of this lot of specimens, the largest snake was twenty-nine inches long with a rattle consisting of nine segments.

The majority of specimens collected were found in the immediate neighbourhood of swamps and along the old tote roads that run through stretches of low ground. Although these records indicate that they prefer low, wet grounds as their habitation, they may often be found far away from water, taking up their abode wherever there is sufficient cover, among which they can find at short notice a place of retreat. Several examples were taken in the clearings around the old lumber mill and outer buildings of Johnson's harbour. Some were found in dry, rocky situations, and others were taken on the farmland adjacent to the Crane river which runs across the peninsula.

None of the specimens taken by the writer were found hidden under logs, stones and the loose bark of fallen trees, although many harmless species select such temporary hiding places. Several specimens that were pursued in swampy situations made their escape among the roots of cedar trees and in the drier areas they were observed to glide beneath well rooted stumps, and from such impenetrable places it was next to im-

A CAPTIVE MASSASAUGA (*Sistrurus catenatus*)

Photo. by Prof. A. F. Coventry

possible to dislodge them. When surprised in its native haunts the Massasauga does not ordinarily try to get away, being lazy or responding to the instinct that quiet is a better safeguard than than flight, it will remain motionless and, with an occasional flick of the tongue, await developments. If the disturbance is not too great it will move lazily away, for this species is not aggressive and seldom strikes unless stepped upon or approached within eight or ten inches. If surprised while foraging, the Massasauga will invariably make a dash for safety and it is when cut off after an attempted escape that it displays the greatest anger and excitement. When cornered and unduly annoyed the Massasauga will strike repeatedly with closed jaws and its aim is not always in the direction of the disturbance. If prodded with a stick it will turn and with some deliberation attempt to drive its fangs into the object of its annoyance.

The Massasauga is easily taken alive. The majority of specimens were made captive in the following manner. A short stick stretched across the mouth of a bag, with another stick pressed against it forming a T sufficed to hold the bag open, while the snake was scooped in. This species is safely handled with a pair of leather gloves, and by pressing the head to the ground with a stick can be grasped securely close to the head. In this way it cannot strike the arms or other exposed parts of the operator.

Definite information concerning the toxicity of *Sistrurus* venom is very meagre. Ditmars, in his Reptile Book, says of this species, "The bite of an adult if properly delivered—both fangs thoroughly perforating the flesh—might readily produce the death of man." According to

farmers, animals that have been bitten by the Massasauga, such as dogs, horses and cows, suffer much, have troublesome swelling, and are lame for several days.

The writer's brother, while placing some newly arrived Massasaugas from Georgian bay in a case, was holding one by the neck when his fingers slipped. Turning its head the snake buried both fangs in his thumb. A ligature was at once applied and both fang punctures opened with a razor to a greater depth than the fangs had actually penetrated. The wounds were sucked and washed and a solution of permanganate of potash applied. When the ligature was removed the thumb throbbed painfully and the arm became badly swollen. After the second day, however, the swelling rapidly subsided. In one week the hand and arm were normal, and he was none the worse for the experience.

Application to the Antivenin Institute of America for information on the venom of this species elicited the following reply. "We have extracted venom from a number of specimens of *Sistrurus catenàtus* and have found that the quantity of venom has averaged about 5½ to 6 mg. at each extraction. As compared with the Texas rattler, this is a very small quantity, the Texas rattler yielding from 75 to 160 mg. at an extraction.

"Although much smaller in quantity than the venom of the Texas rattler, the venom of ths *Sistrurus* is considerably more toxic. At least, our laboratory experiments on pigeons indicate that the minimum lethal dose when injected intravenously into pigeons is .03 mg., which indicates a toxixity of about five times that of the average venom of the Texas rattler (*Crotalus atrox*).

"This is about the extent of definite information that we have on this venom but think it is enough to indicate that the poison of this species is highly toxic, much more so than that of the Texas rattler, yet because of the very small amount secreted and because of the inability of this species to inject it deeply into the tissues, a bite caused by *Sistrurus catenatus* need not be regarded as extremely serious. In fact we know of no reports in the last two years of any deaths from the bite of this snake. The symptoms, of course, may be very painful and uncomfortable."

The Massasauga soon becomes very gentle in captivity. Several examples now living in the Department of Biology, University of Toronto, have become very tame and although they frequently use their rattles, have not attempted to bite during their captivity.

The rattlesnakes generally eat nothing but warm-blooded prey,—mammals and birds. This species, however, feeds as readily upon frogs as it does on small mammals and birds. Unlike many serpents the Massasauga is not particular in demanding living prey. The writer has often seen captive Massasaugas feeding upon mice which decomposition with its attendant gases had left bloated and with a diffusing odour. The only specimen which the writer has seen feeding in a wild state had almost completed swallowed a Leopard Frog; only the hind legs were exposed. From the dried and shrivelled appearance of these it was concluded that the snake had found during its foraging a frog which had been dead for some time.

NOTES ON THE FOOD OF SPRING SALMON

By H. C. WILLIAMSON, D.Sc.
Pacific Biological Station, Nanaimo, B.C.

DURING the past three years the writer has had the opportunity of making some observations of the food found in the stomachs of spring salmon, *Oncorhynchus tschawytscha* Walbaum, caught along the west coast of Vancouver Island. The results of the examinations are given herewith in brief form.

OBSERVATIONS IN 1926

In 1926 the period of observation extended from March 28 to September 2.

March.—Only a few stomachs were examined and these contained lance fish (Fig. 1).

April.—The food consisted almost entirely of lance fish and the schizopod, *Euphausia pacifica* Hansen (Fig. 2). The latter are popularly known as "shrimps". Two smelts (unidentified) and two small gadids (unidentified) were also observed.

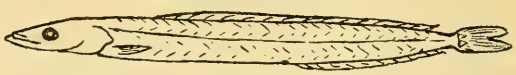

FIG. 1. LANCE FISH, *Ammodytes.*

May.—The principal food was lance, pilchards and schizopods, (*Euphausia pacifica* and *Thysanœssa spinifera* Holmes). Large megalopa of some species of crab were also found (Fig. 3). Only one herring was observed. It measured 7½ inches in length.

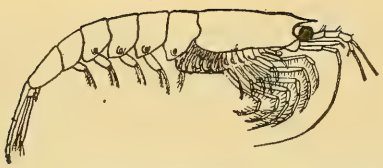

FIG. 2. SCHIZOPOD OR "SHRIMP", *Euphausia*

June.—The principal food was lance, pilchards and megalopa. Lance and pilchards were frequently found in the same stomach. Other forms observed were herring, squid, *Velella* (Portuguese man-o'-war), shrimp (*Crangon* sp.) and remains of a flat fish.

July.—Lance, pilchards and schizopods formed a large part of the food of the salmon. Some herrings, *Crangon*, and squid (Fig. 4) were also observed.

August.—Lance and pilchards continued to be the principal food. Schizopods and some herrings, 3½–7½ inches long, also occurred.

September.—During this month only a few stomachs were examined. Two small herrings 3 and 3½ inches long respectively, were found.

OBSERVATIONS IN 1927, 1928 AND 1929

In 1927 small herrings provided a considerable proportion of the food of the salmon off Barkley Sound, almost as much as did lance. Pilchards were not so common in the stomachs as in 1926. Squid (Fig. 4) was for a time a common food on Wreck Bay Bank, and apparently taken by the salmon from daybreak on for about two hours thereafter.

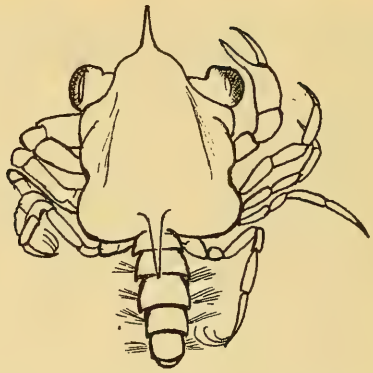

FIG. 3. MEGALOPS OF A CRAB

During the winter the salmon in the inlets feed largely on herrings. In February, 1928, at Nootka, the salmon were feeding on herrings, lance and schizopods. The salmon caught inside the sound had herrings in the stomachs while those caught outside had lance in stomachs. One pilchard was indentified. Herrings were found in the stomach of a spring salmon caught on Swiftsure Bank, August, 1929.

The occurrence of the salmon is dependent on the presence of its food, lance, pilchards, schizopods, and the location of the latter will be determined by the presence of their food (plankton). As the plankton will, from time to time, vary in quantity, quality and distribution, the occurrence of the salmon may be expected to vary, partly at least, with such changes.

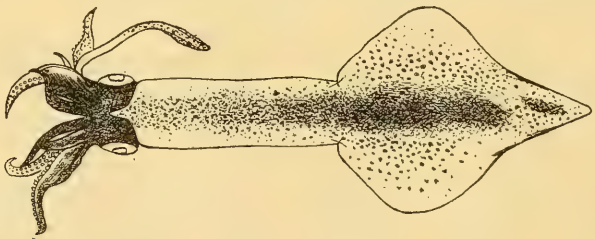

FIG. 4. SQUID

A FURTHER STUDY OF THE HOME LIFE OF THE AMERICAN GOLDFINCH

By HENRY MOUSLEY

IN *The Canadian Field-Naturalist* for November, 1930, I recorded my first experiences in the home life of these charming little birds, the nest having been found on August 14, 1929, about six miles from Montreal on the southern side of the St. Lawrence River. In the present instance, the nest was again situated in the same stretch of country, only about one mile south of the other, being first discovered on September 8th, when it contained five young birds about 10 or 11 days old as near as I could judge. In the previous account

the persistent slow rate of feeding the young—once in every 53.3 minutes—during the twenty hours I spent at the nest, had interested me greatly, more especially so as it was in accord with the experience of others, and it was mainly due to this fact that I was induced to undertake this further study, with a view to finding out whether these conditions held good at all times, the present year favouring the project, since goldfinches appeared to be unusually abundant, so much so that I had no difficulty, on several occasions, in locating six or more nests in very restricted areas. The finding of nests, however, is usually the least of the difficulties to be encountered, for more often than not when found they are either in somewhat dense foliage, too high up, or the lighting is poor for photographic purposes, but worst of all the temperament of the birds has to be taken into consideration and tested, to see whether it is worth while attempting the study or not, that is, if one is working without a tent—which I always do. In once case, where everything such as lighting, height of nest above the ground, and a convenient hiding place were all in my favour, the nervous temperament of both birds would not allow them to venture near the nest so long as the camera was there, although, I tried them for over three hours. Luckily this behaviour, from the very commencement, was the exact opposite of that of the present pair of birds. At least it was so in the case of the male, who fed the young shortly after the camera had been set up, the female, however, taking much longer to overcome her timidity, as will be seen later on. As already mentioned, the nest was located on September 8th, its situation being seven feet up in the fork of a small birch tree—every nest this year, with the exception of one, being in these trees—and was the largest of its kind that has so far come under my notice, in fact, looking more like a double nest, its dimensions being as follows—Outside depth, 5 inches; inside 1½ inches; outside diameter 3½ inches, inside 2½ inches.

Everything except its height above the ground was in my favour, so I decided to cut off the nesting bough and lower it until the top of the nest with its five young was just three feet six inches above the ground, the age of the young—about 10–11 days, as already mentioned—being just about right for such a proceeding, as the sense of fear had not yet appeared, and the period

Female Goldfinch about to feed young.

of parental instinct was reaching its maximum, when it would be unlikely for the parents to desert their young. On my arrival, the old birds were not about, but during the cutting off of the bough they put in an appearance, making a great fuss and demonstration when they saw what was going on, the male, especially, flying excitably all round me, whilst the female in a nearby tree gave vent to the call notes, *bare-bee*, *bare-bee*, interspersed with *beeb*, *beeb*, *beeb*, and *ba-bee*. After the lowering and securing of the nesting bough to the main stem of the tree, I set up the camera with the lens just two feet six inches from the nest, and retired to my hiding place in a little patch of willows, just twenty feet from the nest. I had by this time formed the opinion that I should have little or no trouble with the male, as he had been very bold during the lowering of the nest, and this proved to be the case, for he fed the young at 12.15 p.m., within a quarter of an hour of my secreting myself. It was not until 2.30 p.m., however, that the female ventured to do likewise, and then she approached the nest very cautiously, but once having fed the young her nervousness seemed to vanish, and she often

Nest and 5 Young of Goldfinch near St. Lambert, P.Q.

remained near the nest for quite long periods of time. Half an hour after her first feeding, both birds arrived at the nest, but neither of them fed the young, this being done, however, by the female twenty minutes later, or at 3.20 p.m., and this she repeated at 5.15 p.m., a quarter of an hour before my leaving for home. Thus in five hours the young had been fed four times only, once by the male, and three times by the female, or at the rate of once in every seventy-five minutes, the intervals thus being longer by twenty-one minutes—instead of shorter as hoped—than those of the first study. However, on my next visit the following day, the thing I had set out to determine came about. It was about 10.30 a.m. when I arrived at the site, and 3.30 p.m. when I left, and during those five hours the young were fed eleven times, four by the male, and seven by the female, or at the rate of once in every 27.3 minutes, thus proving that a much quicker rate of feeding than about once every hour does at times occur. On one occasion, the female perched at the base of the nest and remained there for five minutes before feeding the young. The day following (Sept. 10th), saw me again at the site, when I quite expected to find that some of the young would have vacated the nest, so lively had most of them been on the previous day. However, they were all there, but I had to be very careful in setting up the camera and removing a branch I had fixed in the ground the day previous—before leaving—to shield them somewhat from the rays of the sun, but this I managed to do successfully, although one of them almost took to flight during the process. I arrived at one o'clock, and left again at three-thirty during which time the young were fed five times, three by the male, and twice by the female, or at the rate of once in every thirty minutes, another proof that the rate of feeding is apt to vary—more especially I imagine in the later stages when the young are older—and that the male often feeds the young, even, in excess of the female at times, contrary to the statement of the late Ora Willis Knight, who, in his "Birds of Maine" 1908, p. 388, says "that the males rarely if ever feed the young birds, this as well as incubation being done almost exclusively by the mother". Although possessing some three dozen photographs of the parents feeding the young, never before to-day had I seen both of them arrive and feed at the same time, although this is a somewhat common occurrence in the home life of the Warblers. The incident, unfortunately, took place at a time when the sun was hidden behind a cloud, so that the resulting picture is not as clear as the other three taken on this same day, nevertheless, it is interesting as showing not only the rarity of the event, at least, in my experience, but also the fact, that when taking the picture, I had no idea both birds were in it, having noticed only the male just prior to releasing the shutter, the female evidently having squeezed in—from the back—at the last moment, just above her partner, where she can be seen straining down to feed one of the young that was on the outside of those that were being attended to by the male. On another occasion, soon after the male had fed the young, a female Maryland Yellow-throat closely inspected the brood, and thinking she might be on the point of feeding them, I refrained from releasing the shutter at the moment, thereby losing an interesting picture, as she flew off almost immediately afterwards. As showing the boldness of the male, I might mention that on two occasions he perched quite near me, and inspected me closely, thus knowing where I

lay concealed, and yet in ten minutes after,—on both occasions—he was at the nest feeding the young. It is things like this, and the fact that one can see all that is going on around one, that keeps me from using a tent, although, of course, there are times when this mode of concealment is absolutely necessary if one is to get any pictures at all. Other interesting birds that visited my hiding place, were a whole party of Maryland Yellow-throats, two young Magnolia Warblers, and best of all, a fine male Wilson's Warbler, all of which remained with me for some little time, simply because I knew enough to keep absolutely still and rigid, the one thing necessary, which, however, is so difficult to instil into a novice. I was almost forgetting to mention that a young hare also paid me an extended visit, as well as several small mice. In addition to these visits, I heard the notes of various birds all around me, such as those of the Kingfisher, Virginia Rail, Black-billed Cuckoo, Swamp Sparrow, Cedar Waxwing, Catbird and others. It hardly seemed possible when taking my departure, that I should find the young Goldfinches still in the nest on the following day, but so it turned out, for upon arrival at 10 a.m. the next morning, all five were still in the nest, although two of them immediately took wing on seeing me—the instinct of fear had been acquired the day previous—flying strongly away to the tops of some small birches before I had even time to get out the camera. A third soon followed suit, but I managed to capture and replace it in the nest, but off it went again, so I decided to let it go, and devote my attention to the remaining two, which being younger than the others, seemed disinclined to leave their home, and I still had hopes of getting some more pictures of the old birds feeding them. However, this was not to be, as the parents never came near the nest again during the three hours I remained on the ground, notwithstanding the fact that, in conjunction with the others, these two youngsters kept up an almost incessant call note, which sounded to me like *chee-pee*, *chee-pee* or *shee-pee*, at first, very softly, and then louder and more insistent, no doubt as they became more and more hungry, until at last, one of them, more lusty than the other, climbed out and perched above the nest, eventually flying to a nearby willow bush, where the female found and fed it. There now remained only the youngest of the brood in the nest, and as the parents had devoted all their attention to those that were in the trees or bushes, and had failed to visit the nest for the past three hours, I thought it best—before leaving—to remove this youngster also, and place it with its companion, where it would stand a chance of being fed by the female which, as I have previously stated, had already found and fed the other. Judging from their plumage and power of flight, the first three to leave the nest must have been 14 to 15 days old, the fourth perhaps a day younger, whilst the fifth, or youngest, possibly hatched out a day later than the fourth. Before leaving for good, I took a general view of the nesting site, which coupled with the pictures of the parents feeding, and the young at various stages, will help to remind me of the very pleasant seventeen and one-half hours I spent with this delightful little pair of birds, the fouling of whose nest through want of attention—a trait common to other members of the family also—was their only fault, but one which, unfortunately, the camera never fails to record, at least, in the later stages of home life.

AN EXPEDITION TO SUB-ARCTIC CANADA, 1924-1925

By CAPT. J. C. CRITCHELL-BULLOCK

Canis tundrarum occidentalis.—BARREN GROUND WOLF.

(*Continued from Page 196*)

THIS animal was the only species of the wolf observed by us north of the timber. They vary in colour considerably from pure white to a tawny colour somewhat resembling that of the lion, although the fur of the breast, belly and legs always tends to whiteness.

They were numerous about Artillery Lake, and to the northward, during the winter of 1924-25 and many were trapped by members of the party. To describe the colour variations in detail would be a lengthy proceeding, and it is not to be attempted here. However, it would seem that the older the animal the more likely he is to be white, and, I believe, all the white individuals trapped were found to be advanced in years. The colour which is most common amongst the younger animals is grey with distinct back markings of black, usually in the form of three stripes running from neck to tail, one along the centre of the back, the other two a few inches lower on either side. The tails of such animals are tipped with black.

In the white wolf inspection showed us that the last touch of colour remaining before the hide may

be said to be perfectly free of blemish, is to be found on the top of the back immediately in front of the tail; here, occasionally, a few black hairs will be found.

Most of the white wolves captured, being aged animals, were found to have bad teeth, with, in some instances, a few altogether missing. Such animals were usually thought to be travelling alone, and, when taken, were found to be in poor condition.

During the winter a wolf was caught and skinned which had been wounded. A bullet had struck him in the shoulder, smashing the bone. A great deal of suppuration had occurred, and it was evident that for some time the wound had been in danger of infection. How long the animal had been in this condition it is difficult to say, but for over a week he had been doing considerable damage along the trap line, and also the wound did not appear to be of recent occurrence, possibly three weeks old. Whenever the wolf moved the injured leg dragged on the ground, but in spite of this he was found to be exceedingly fat. It is doubtful, however, whether he would have lived had he not managed to make a regular tour of the traps and steal all the baits. In spite of the clumsiness that must have been consequent on his injury, he was the most difficult wolf we had to trap during that winter.

There was no sign of disease amongst the wolves in our district, although B. Lorringer, the Government wolf-poisoner, told me that two years previously he had found individuals in such a diseased condition that his men refused to handle them. The only sign of parasitical infection was the presence of worms in the intestines, and many of them were troubled in this manner.

Wolves are mentioned in the portion of this report treating of their economic importance with respect to the caribou and musk-oxen, and elsewhere occasional reference to this species has been made. It should therefore suffice to describe as well as possible their movements as observed by us between Great Slave Lake and Hudson Bay.

Wolves were first noted on Artillery Lake during the night of 23rd-24th September, 1924. They were not seen but merely heard, apparently having become aware of the fact that we had been killing caribou. Caribou were not numerous however along Artillery Lake at this time, and it was not until later that we again detected their presence. A caribou carcass on the eastern shore of that lake, about which someone had set several traps, apparently for the purpose of catching wolves, had not been visited except by gulls and ravens, three of the former having sprung a trap, and been caught.

On October 1st wolves were more numerous and by the 2nd I noted that their tracks seemed to be more numerous than those of the caribou.

It is interesting to observe that whereas it might be expected that wolves would be observed following hot after migrating bands of caribou, it was not always the case, and on not a few occasions they appeared to be in advance of large bands of moving deer. I never satisfactorily accounted for this, although I often thought that in some neighbouring district a different caribou movement might have been occurring, a movement of which the wolves were aware and were travelling to intercept.

On October 8th three skeletons of caribou were found. They were obviously animals that had recently been killed by wolves. All were full grown bulls. We believed that in the immediate vicinity a litter of wolves had been brought up, because in various other places the remains of caribou killed earlier in the year were found, also about this place the tracks of a pack of wolves were frequently discerned. It was here that the three wolves of a pack were trapped, animals that have been described elsewhere, members in all probability of the actual pack making the locality their headquarters.

For the next ten days wolves were scarce. This was probably due to the fact that the caribou were massing in certain places, other than where we were, awaiting the formation of firm ice to permit them to move northwards. On the western side of Artillery Lake where members of our party were travelling, it was reported that it was evident that wolves were accounting for many caribou by the 20th October.

However, on November 2nd I have noted in my diary that fox and wolf tracks were as thick as those of rabbits about a warren, also that they were presuming so far as to walk over the roof of our house and eat the meat we had cached in the snow outside the door. This was strange, because in our vicinity there were very few caribou, but on the following day I travelled thirty miles down Artillery Lake and there ran into several hundred caribou waiting to cross to the northeastward. It would appear as though the wolves and foxes had sensed the presence of large numbers of caribou on the far shore, and they, also being fearful of the ice, were quietly waiting until their victims should decide to make the crossing into their midst. It must be remembered, however, that the nearest caribou (in large numbers, at least) were fully thirty miles away, a distance that no animal could see over to recognize deer, and a distance that even with the wind in the right direction would prove fairly

lengthy for the best of noses even with an empty belly behind it. As it happened, however, the wind was in the wrong direction. I leave it to the reader to reason out such problems as these.

By November 11th all the wolves had apparently gone north, the tracks of four separate individuals pointing to this fact. On the 20th, however, they were numerous again, moving in the middle of the caribou which were and had been numerous. With the disappearance of the caribou on the 22nd the wolves also departed.

Foxes were very numerous on and about December 7th, although wolves were not seen. But on the 18th wolves were with us again and in large numbers. It would seem as though they succeeded in driving off the foxes. They were more plentiful still between December 29th and January 2nd, 1925, and it is probable that they were following behind the caribou that had moved eastwards a few days previously. They continued with us until January 22nd, and then left.

With the rather increased number of caribou towards the end of February wolves visited our part of the country again and remained in small numbers for a considerable period.

On March 6th we discovered the signs of a great wolf battle. From the tracks it was almost impossible to decide the sex of the animals, but the impression given was that of the three, two were males and the third a female. Although wolves trapped subsequently to this showed no signs of "running", the behaviour of these three animals, as interpreted by their tracks, strongly testified to the fact that the season was not far off.

On March 10th we trapped an aged white wolf, a male, length 62 inches, tail vertebrae 15 inches, hind foot 5 inches, weight 109 lbs. Actually he was a very large animal, although his short tail and leanness brought his measurements down. His height at the shoulder was 32 inches, however, which was the same as that of the largest wolf taken by us. This wolf was accompanied by another younger and quite dark coloured animal, probably a female from the way in which it behaved towards the trapped animal. The male wolf was not "running".

From March 16th to 20th wolves were numerous again. Once again apparently heading the caribou movement, at least certainly not in rear of it. By the 31st, all the fur was on the move and between that date and April 3rd wolves and foxes passed in hundreds travelling northwards. The wolves, more often than not, were in packs of from three to five. Then until the 8th wolves were not seen, but with the great eastward movement of the caribou at that time they again commenced to pass.

On April 2nd I saw evidence to prove conclusively that the Barren Ground wolves were copulating. Those animals that had not paired off were observed persistently following female foxes. I did not believe a wolf would continue to do this after he had discovered what animal it was he had been following, but the two sets of traps put down to prove this showed that a wolf would walk right up to and all round the trapped fox before leaving her. This, however, I believe to have been due to curiosity as much as anything.

A young male wolf shot on April 8th measured hind foot 4¾ inches, tail vertebrae 13 inches, length 60 inches, weight 96 lbs. Age about twenty-two months.

A large white male taken on April 9th measured: hind foot 5½ inches, tail vertebrae $17\frac{5}{16}$ inches, length $64\frac{9}{16}$ inches, weight 131½ lbs. Age probably about seven years. This animal had a few black hairs on the centre of the back just forward of the root of the tail, this blemish is hardly noticeable in the hide, being but the size of a dollar piece, and only about twenty hairs being coloured.

After April 27th the presence of wolves was not detected until June 15th, when, on Sifton Lake two young (two or three year old ?) wolves were seen feeding on the carcass of a caribou on the edge of the lake ice, an animal that had evidently died in a deep soft snowdrift. Their sex could not be determined. On the 19th the wolf den already referred to was discovered. The mother was alone and she appeared to be quite a young animal.

No signs of wolves were then seen until the Dickson Canyon was reached. Here their tracks were seen where, evidently, they had passed up and down the river attempting to find a place to cross. A solitary female, however, in a fat though somewhat mangy condition was seen and shot. Like the other wolves observed during the summer she behaved in an extraordinary manner, rather after the fashion of a frightened dog; not running away for any considerable distance when shot at, but trotting off for a few yards to stop, turn round and look anxiously in our direction again.

An occasional wolf was to be seen throughout the remainder of the journey, but as all the caribou had passed either north or south no definite movements on the part of numbers were recorded. Even during the southward migration in July only an odd animal was seen following the movement. A young male wolf shot on July 28th was found to be very fat. Another in fair condition was shot on August 5th, measurements: hind foot $4\frac{7}{16}$ inches (very blunt claws), tail vertebrae 15¼ inches, length 60½ inches, weight 112 lbs.

Gulo luscus (Linn).—HUDSON BAY WOLVERINE

This well-known species was nowhere found to be common, four individuals only being trapped or seen in the treeless region.

The date on which these animals hibernated was not ascertained, but that they do so seems evident from the fact that on January 27th the tracks of one were seen about a den where it had obviously been lying up for the winter. The animal had pushed its way out through the snow, taken a fox from a trap and had returned again to its den.

A male wolverine was trapped near the mouth of Casba River on November 19th. The next to be taken was on April 11th, and another was seen shortly afterwards. The last occurrence of this animal was one seen during the night of June 2nd-3rd on Smart Lake.

Vulpes fulva (Deswarest).—RED FOX

The only sign of this animal north of the timber was seen on Thelon River during August, when the tracks of a large fox were observed in the sand on the river bank. There was no definite evidence to prove that the animal was a representative of this species, but the size of the tracks gave that impression.

Generally the red fox seems to keep to the timber and although one was taken at a point twelve miles north of Timber Bay on Artillery Lake it is rare even about the densely wooded district of old Fort Reliance. Only about six were taken on Artillery Lake during the winter of 1924-25, all those being trapped south of the treeless country.

Alopex lagopus innuitus (Merriam).—WHITE FOX

During the winter of 1924-25 about a thousand of these well-known animals were trapped in Artillery Lake and in the immediate vicinity. About six were of the blue colour phase.

The white fox is a great traveller, he may be here to-day in large numbers, and to-morrow there may be no sign of him at all. It is difficult to decide exactly the significance of these movements, because, although they are doubtless occasioned by the search for food, white foxes are not infrequently numerous in a locality from whence the caribou have long since migrated, and where all small rodents have definitely hibernated. No doubt they often anticipate the movements of caribou and anticipate them incorrectly. This impression is somewhat strengthened by the fact that foxes were often found in a starving condition when moving in large numbers.

This species was observed from October, 1924, until June, 1925. East of Campbell Lake none were seen, and even the southward migration of caribou in July failed to bring with it attendant foxes. Indeed the Thelon Valley seemed absolutely destitute of fox life, only one track being seen between the last named lake and Hudson Bay and that apparently being the track of a coloured fox. However, the Eskimos met with on Aberdeen Lake informed us that this species migrated to the shores of that lake during the winter, and that they themselves had succeeded in taking quite a number.

Until October 6th foxes were scarce on Artillery Lake, but on that date the tracks of large numbers were seen, all *A. l. innuitus*, and unless otherwise stated it is to this species that I refer when using broadly the word fox.

On October 10th I observed a fox endeavouring to catch ptarmigan. Success did not attend his efforts, and although he (apparently) continued to do so the next day still unsuccessfully, I could not form the opinion that he was hunting for amusement.

By October 30th foxes were becoming quite tame and numerous and would feed on the scraps that we used to throw outside the house.

A white fox trapped at the edge of the timber on November 15th, though prime, was found to have no guard hairs and was deemed in consequence to be of little value. In my diary I find a note to the effect that white foxes trapped in the timber further south on November 16th were dark and unlikely to command a good price. At this time also several trapped in the treeless region were still slightly touched with colour, the remains of their summer pelage; they were also very reduced in condition in spite of the fact that caribou were numerous. By December 4th I note both sexes as being fat, although a week previously they had been poor, particularly the females.

At about this time a fox was trapped that had lost its left fore foot. I made a note of this fact and later ascertained that one of our party had a month previously liberated an unprime fox from a trap by cutting off the trapped foot, the foot holding him merely by a few tendons.

During the early part of December foxes were exceedingly numerous, and a line on which nineteen traps had been set yielded ten foxes in one night.

By December 15th all foxes were white and in a condition to fetch top prices, previously an

occasional animal was trapped that might be described as shoddy.

In January foxes were less plentiful, and those taken were found generally to be in poor condition; an occasional fat male would occur, however.

February found foxes more numerous again, most of them apparently being females. March proclaimed the same condition.

There were two great movements of foxes during the winter, the first on November 2nd. Unfortunately I failed to note the direction of the movement; so far as I remember, however, it was north. In early December they moved in from the north and apparently remained to the southward for the winter. On April 1st the second great movement occurred and the snow showed that hundreds had moved to the northward moving with the wolves and with the caribou migration.

All the foxes trapped seemed to be entirely free of disease except that several had worms and a few had a parasitical tick infection of the hide, several hundreds, and in some cases thousands, of ticks being found under the fur.

This fox apparently will feed on anything. Caribou meat constituted the usual contents of stomachs examined, but occasionally a fox would be found that had been eating quantities of various kinds of herbs or mosses.

Some foxes apparently den up during the winter. It is difficult to say to what extent this occurs, but I saw a number of hides that gave the impression that the animals had, during the coldest weather, betaken themselves to holes and laid up for a period.

The psychology of the fox is peculiar and interesting, but I can give only one example here. I had happened to walk down to a certain setting of traps when I noticed that a fox caught in one of them was being worried by another that was free. Seeing that they were snapping at one another and likely to do harm I unslung my rifle and proceeded to shoot the uncaught animal. It was on off day for me and although within a hundred and fifty yards of the beast I failed to hit him with six shots. Nevertheless the bullets spat around him so closely that time and time again he must have been struck with flying ice, for this was on a river. However, nothing served to disturb his equanimity and during that two minutes he moved unconcernedly in a small area not greater than twenty square feet. Not wishing to waste more ammunition I walked down to him, and when within fifty yards, he moved off. While taking the other animal out of the trap I happened to turn round to observe that the one I had been shooting at was calmly picking pieces of meat off a bait about fifty yards behind me. Taking a piece of ice I threw it at him and he ran away. He immediately returned, however, and as I watched him for several minutes I saw him choose and tear off pieces of meat and go away varying distances to cache them in the snow. After a while I thought I would try and catch him, so, while he was burying a piece of meat, ran over and dug up the traps about the bait and proceeded to re-set them. In the middle of this occupation I saw him approaching and was forced to leave my work half done, moving off a few yards. It is difficult to shorten the story, and already I have left out several most interesting details, but space does not permit verbosity, and I will conclude by saying that finally after five attempts to catch him by every sort of trick, I suddenly saw him approaching me when at no greater distance than ten feet. Move I dared not for some reason, and stood with the set trap immediately between my feet. Around the bait he walked, which I had covered with blocks of snow to make him scratch and move about in the vicinity of the traps more, until eventually he passed between my legs and stepped right on to the pan releasing the jaws. I immediately took him out, and returned with him to the house. I intended keeping him, but unfortunately Hornby was taken seriously ill that night and added duties forced me to kill the fox.

One of many other incidents I think may be given. I found a fox in a trap around which a few minutes previously a wolf had walked. The fox had evidently been in the trap when the wolf had walked up, but not long enough by any means for exposure or starvation to have affected him. That fox was obviously frightened almost to death, and from its behaviour, I took if for granted, was mad. The wolf had not touched him.

Measurements of foxes were as follows. I measured about fifty:

Male. Length $34\frac{5}{16}$ inches, tail vertebrae $13\frac{1}{2}$ inches, hind foot $2\frac{1}{2}$ inches.

Male. Length $30\frac{1}{2}$ inches, tail vertebrae $10\frac{3}{4}$ inches, hind foot $2\frac{2}{5}$ inches.

Female. Length $31\frac{1}{4}$ inches, tail vertebrae $12\frac{1}{4}$ inches, hind foot, $2\frac{3}{10}$ inches.

Male. Length $32\frac{3}{8}$ inches, tail vertebrae $12\frac{1}{8}$ inches, hind foot $2\frac{1}{2}$ inches.

Female. Length 32 inches, tail vertebrae $12\frac{1}{8}$ inches, hind foot $2\frac{2}{5}$ inches.

Male. Length $37\frac{1}{2}$ inches, tail vertebrae $14\frac{1}{2}$ inches, hind foot $2\frac{9}{16}$ inches, weight $14\frac{1}{2}$ lbs.

Male. Length 33 inches, tail vertebrae $13\frac{1}{2}$ inches, hind foot $2\frac{9}{20}$ inches.

Female. Length 32 inches, tail vertebrae 12⅝ inches, hind foot 2⅜ inches.

One of the blue colour phase, a male, measured: length 32½ inches, tail vertebrae 11¾ inches, hind foot 2 3/10 inches.

Foxes were noted as "running" at the same time as were the wolves, during the latter part of March.

Lepus arcticus canus (Preble).—KEEWATIN ARCTIC HARE

These hares were first noted on September 17th on the east shore of Artillery Lake near Beaver Lodge.

The species is not scattered evenly throughout the country under review, but occurs in colonies of varying size, generally of about six pairs in favoured localities, usually on rough rocky hills of a morainic nature.

A young male (of the year) captured at Lake Hanbury on July 5th, measured: length 9 inches, tail vertebrae 1 inch, hind foot 1 1/10 inches. We saw no evidence of this species eastwards of this point, though without doubt it does exist.

Citellus parryi (Richardson).—PARRY GROUND SQUIRREL

This spermophile is common throughout the region under review, although in certain districts it is rarely observed. The most noticeable of these is the wooded district of Thelon River where often for several miles one might travel without seeing any signs at all.

The animal was first seen towards the northern end of Artillery Lake during September, 1924, and on the eastern shore, wherever mounds of sandy clay formed suitable burrowing ground, the species was numerous.

Between Artillery Lake and Hudson Bay sandy patches frequently occur and when they are of small size and isolated they will be found almost invariably to contain a colony of these animals. Where grass grows seems to be the most favoured locality, and although burrows were found in the sides of eskers whereon grass was not growing it was not usual.

About most of the burrows in isolated sandy patches in the heart of the rougher treeless district evidence in the form of uprooted boulders and deep excavations testified to the fact that this animal is considered a dainty morsel both by bears and wolverines.

The average size of a burrow is from fifteen to twenty-five holes, more than half of them being unused.

After the timber on Thelon River was passed this species was observed more often living along the banks of the river, and as we paddled down stream every few yards would bring to view one of these pretty little animals sitting on a rock, stiff and upright, inquisitively watching us as we passed. Between the last wood on Thelon River and Beverly Lake the banks of the river are usually of heavy drift material, in places perhaps a powdered limestone, and this formation seemed to be most attractive to them.

This spermophile finally hibernated in the treeless region between October 20th and 26th. On the 20th they were last seen above the snow, but on the 26th one was trapped by a buried flour sack to which it had been over-attentive. After that date until the spring none was seen.

May 23rd was the date on which we next saw them, the place being the northern end of Campbell Lake. Two only were observed, and although another was seen on the 25th it was not until three more weeks had passed that they were all on the move. A female killed on June 22nd measured: length 14½ inches, tail vertebrae 4⅜ inches, hind foot 30 mm. She was found to have six embryo young, four females and two males. Their length was about 1½ inches. The food of the animal was found to be mosses of a yellow and black variety. A male killed at Baker Lake September 1st, 1925, measured: length 15⅝ inches, tail vertebrae 4½ inches, hind foot 1 3/16 inches.

Members of this species met with on Thelon River were found to be more wild than those on Artillery Lake. I assumed the reason to be that whereas on Artillery Lake the constant hunting and trapping of Indians keeps predatory animals away from the district to a large extent, in the unvisited country of the Thelon they have every opportunity of visiting the burrows of these animals undisturbed, and at certain times of the year no doubt the districts wherein spermophiles are most numerous are visited by predatory animals in considerable numbers regularly.

Dicrostonyx rubricatus richardsoni Merriam.—RICHARDSON COLLARED LEMMING

One specimen of this lemming was taken to the northward of Artillery Lake on October 26th, 1924. Another was taken towards the headwaters of Hanbury River on June 12th, 1925. The former was turning a silver grey colour, the latter had practically changed to summer pelage.

Lemmus trimucronatus (Richardson).—BACK LEMMING

A specimen referable to this species was killed on October 1st. It was observed eating parts of another of its kind that was lying dead on the snow.

Microtus pennsylvanicus drummondi (Audubon and Bachman).—DRUMMOND MEADOW MOUSE

A young mouse taken in the treeless country about Artillery Lake on September 26th, 1924, is referable to this species. It was found to be extremely numerous in the sedges on the eastern side of the lake.

Peromyscus maniculatus borealis Mearns.—ARCTIC WHITE-FOOTED MOUSE

This species was found to be abundant in a shack on Pike's Portage during April, 1925. A specimen taken differs somewhat when compared with those in collections; measurements: length 146 mm., tail vertebrae 67 mm., hind foot, 19 mm.

Sorex sp. ?—SHREW

Shrews were seen only at the northern extremity of Artillery Lake during the fall of 1924. I managed to collect a specimen, but unfortunately it was lost. This shrew was caught on November 30th, it was apparently living in the sod wall of our second camp where the heat of the house provided it with sufficient warmth, and the scraps lying about sufficient food to keep it from hibernating.

(*To be continued*)

NOTES AND OBSERVATIONS

CORRECTION.—Black Duck No. 457515 (not 457514, as recorded in *The Canadian Field-Naturalist*, Vol. XLIV, No. 7, page 171), banded by H. S. Osler, at Lake Scugog, Ontario, on October 3, 1926, was shot at Hunting Island, off the coast of South Carolina, on December 19, 1928.

INFORMATION WANTED ON BAIRD'S SPARROW (*Ammodramus bairdi*).—A comprehensive study of Baird's Sparrow, *Ammodramus bairdi*, has been underaken by B. W. Cartwright and associates who will appreciate any information on the species. Migration dates, breeding data and label data from specimens in private collections are particularly desired. Information regarding the southern limits of the winter range is also needed. We expect to have our material ready for the press by September, 1931. Address communications to B. W. Cartwright, 392 Woodlawn Street, Deer Lodge, Winnipeg, Manitoba.

WINTER RAMBLING OF A WOODCHUCK.—On February 2, 1930, we visited the valley of the Rouge River, east of Toronto. The snow was deep and walking was not easy without the aid of snowshoes. Under these circumstances we were surprised to come upon the trail of a Woodchuck that had evidently been made the same morning. It must have been heavy going for the animal and the mark left was merely a groove, three or four inches deep, with the foot prints at the bottom. The trail came down the east side of the valley and zig-zagged along the hillside for several hundred yards, leading in and out of every crevice under logs, roots, or brush-piles. Finally it left the hill and we traced it across the river flats for about a quarter of a mile and into a dense willow growth. Here there were trails in every direction, crossing and recrossing each other, probably all made by the same Woodchuck, but we were unable to find either an end of the trail or a place where it led on again across country.

Apart from the novelty of finding a Woodchuck travelling so extensively at such an early date and when the snow was so deep I was reminded of boyhood experiences when we used to follow the Woodchuck trails in early spring from one colony to another. Sometimes these would lead for a mile or more through the woods but would always end at another group of burrows pushed up through the melting snow. Why a single animal should leave one colony and travel so far to another and how the whereabouts of the latter was known always seemed a puzzle to me. —R. J. RUTTER.

WHITE-THROATED SPARROW IN WINTER.—While observing birds in Cedarvale ravine, Toronto, on January 5, 1930, with Messrs. Jas. L. Baillie, Jr., R. V. Lindsay and F. H. Emery, my attention was attracted by the note of a White-throated Sparrow coming from a brush-pile in a garbage dump. The bird was collected and proved to be a male. It is now in the Royal Ontario Museum of Zoology, the first winter specimen

for the Toronto region[1]. Prior to the date of collection I had seen this bird, or another, at the same place on three occasions earlier in the winter. The abundance of cover afforded at the dump and the continuous availability of food were undoubtedly the factors that influenced the bird to remain here.

A search of the records reveals the fact that the first White-throated Sparrow to be seen here in winter was on January 21, 1926, when Mr. R. G. Dingman saw one at York Mills. This record has not previously been published. During the winter of 1927-28 three individuals were noted about the city by members of the Brodie Club, two at Cedarvale and one in High Park[2]. The latter remained throughout the season. In December, 1928, one was seen at Swansea and another at Cedarvale, by the writer and others[3]. This winter, in addition to the specimen collected, Mr. R. J. Rutter and I observed one at East York on December 1. The present specimen is, then, the eighth winter observation, all but one of which have been observed by the writer. It may be of interest, in this connection, to record that one was seen at Hampton in Durham county on December 22, 1927, by Mr. A. E. Allin. The species has been seen in winter at London, Ottawa and Arnprior, on rare occasions.

Perhaps there are other Ontario centres that have records of this bird in winter. If so, it would be interesting to have them recorded in *The Canadian Field-Naturalist*.—CLIFFORD E. HOPE, *Toronto*.

BLACK GAME AND CAPERCAILZIE LIBERATED IN NOVA SCOTIA.—Nova Scotia has recently been favoured by the introduction of two new and interesting species of game birds, viz., Capercailzie and Black Game. Ten pairs of the former and five pairs of the latter were brought in from Sweden last autumn by the Honourable F. B. McCurdy of Halifax and liberated on October 7th, 1929, at South Brookfield, Queens County, and individuals of this small flock are reported as having been seen from time to time during the winter. Within a week or two after the birds were released, one of the Capercailzie was found with a broken wing which apparently was the result of its having collided with a telephone wire and it is understood that the injuries were so serious that the bird was of necessity killed. Rumor also has it that two of the Black Game were killed with stones by small boys who it would appear did not realize the seriousness of their misdemeanour. It is felt by those who know these birds and understand their natural requirements that they should do well here.—R. W. TUFTS.

MORE HUNGARIAN PARTRIDGES LIBERATED IN NEW BRUNSWICK.—About two years ago Mr. J. M. Robinson of St. John liberated a number of Hungarian Partridges at Rothesay, St. John County, but for reasons which are not clearly understood they appear not to have survived. On March 31st, 1930, Mr. Robinson released twenty-five more pairs and twenty-five additional pairs were turned loose at the same point on April 14th, 1930. The apparent success which has attended a number of Nova Scotia introductions of the species, it is understood, is encouraging Mr. Robinson to repeat his experiments.—R. W. TUFTS.

CARING FOR A BABY SCREECH OWL.—Attracted by the angry shrieks of robins and blackbirds one June morning, we saw a small grey object flopping about on a nearby tennis court in Westboro, near Ottawa. On investigation we found a very pretty little grey owl. It was unable to fly, so the only thing, apparently, was to take it to a place of safety; but our acquaintance with owls was not sufficient to teach us that their claws are ready for business before their wings. Our education along these lines was soon complete, however, for the "helpless" little fellow dug claws and beak into our hands, leaving scars which we had as a souvenir of his visit for many days. In spite of his protests we got him safely to the house, and left him in a room until he was banded. That evening we placed him in a box on an upstairs balcony where we hoped the parent birds would find him. As soon as it became dark he started a continuous calling, and about 1.30 a.m. there was an answering call which came closer, evidently following the call of the youngster; then everything was quiet and we knew the old birds had found the little fellow.

During the following day we kept the box covered with a window screen in case of accident and did not remove this until everything was quiet for the night. This time the old birds were waiting and came immediately we uncovered the box and left the balcony. A parent bird lingered a minute on the box and then dropped in, to the evident delight of the youngster. Two days later when the cover was removed from the box the little fellow made every effort to fly, but only succeeded in flopping out of the box to the edge of the balcony. The old birds came and fed it there but in its efforts to fly it flopped off the balcony to the garden below and imme-

[1] R. J. Rutter, *Can. Field-Nat.*, Vol. 44 : 38, 1930.
[2] S. L. Thompson, *Can. Field-Nat.*, Vol. 42 : 105, 1928.
[3] S. L. Thompson, *Can. Field-Nat.*, Vol. 43 : 36, 1929.

diately two cats, evidently anxious for a little variety in their diet, jumped out at him. We were just in time to save him from death. We then decided to try how he would get along on the tennis court again. Putting on thick gloves we carried him across the road, but found we were followed by a procession of cats. Feeling the little fellow's fate was sealed if we put him down, we took him home again. This time we placed him in a barrel, and we were well repaid for our trouble; the moon came up full and bright that night, and we had a wonderful view of the owl family. First came one owl; it was a little suspicious of the barrel but, as all was quiet, it soon dropped in and fed the little one. After a short time along came the other parent; it certainly was a handsome fellow, its reddish coat with light markings plainly visible as it sat in the moonlight with a mouse hanging from its beak. It must have tasted good, judging by the squeals of delight which greeted it in the barrel. We had put some pieces of coarse raw meat near the barrel to help in the providing of meals and they were picked up eagerly.

Wakened again about 4.30 a.m., by the angry shrieking robins who dashed about with no regard for traffic laws, we saw one of the older owls making its last trip for that night with food, although it was bright daylight.

On June 16th the robins again wakened the neighbourhood and we discovered the young owl balancing gingerly on the railing of the balcony. Feeling that we should like to watch him for a few more days we tacked cotton along the railing, but on the morning of the 18th we saw him fly to the railing of the balcony, flap his wings and fly into a tree. From there he flew into a thick patch of bush; the robins had a busy day keeping track of him. In the evening the old birds returned to the balcony, but soon followed his calls and found him in some low trees. Two or three evenings longer we saw him, flying from one tree to another with the parent birds still feeding him on mice and June bugs.—EUNICE NICHOLSON.

BOOK REVIEW

HIGHER FOSSIL FAUNAS OF THE UPPER ALLEGHENY. *By Kenneth E. Caster, Bulletin of Amer. Palæontology, Vol. 15, No. 58, pp. 4-174, Pls. 1-59, 1930.*

There is an extensive region bordering the New York-Pennsylvania boundary in which the line between the Devonian and Carboniferous systems has been drawn much higher in the sections by some geologists than by others. In parts of this region the fossils which pioneer workers labelled as distinctly Middle Devonian have a disconcerting way of reappearing in the sections hundreds of feet above the zone in which they were once supposed to have become extinct. Upper Devonian fossils which staged a comeback in early Carboniferous times may possibly be in part responsible for the zone of disputed age.

The work under consideration deals with the faunas within and near this zone of uncertain age. The author has avoided the field of polemics by omitting to state in most cases for the species figured and described the system in which they occur. If, as some geologists affirm, there had been complete emergence of the continent at the end of Devonian time, there would be small excuse for leaving, as this author has, most of his new species on a nameless doorstep. But the present stage of our knowledge of the systematic parentage of the varied sediments and faunas of this region is such that the author may be pardoned for leaving to others the task of dividing his faunas into Carboniferous and Devonian biotas. We cannot, however, so easily excuse the enigmatic title used for this paper. A good title should let one know at sight to what part of the surface of the earth and the general geological section it relates. This one does neither; while the author may have intended "Upper Allegheny" to give his paper geographical orientation the geologist has no means of knowing until he reads the preface that the title does not refer to the upper part of the "Alegheny series" of Rogers and deal with Coal Measure faunas. In this connection the observations of Professor W. M. Davis[1] may be quoted: "A title should not be a table of contents but only a concise name, easily cited. On the other hand, it should not omit essential words; for example, 'Fossils of the Dobreva formation' is not so intelligible as 'Lower Triassic (Dobreva) fossils from Nevada' ".

One of the new species from the Conewango formation,—a portion of the stratigraphic "no-man's land",—has attached to it generic names familiar in Mesozoic and the Ordovician faunas, but quite unfamiliar in either Devonian or Carboniferous horizons. This shell, *Anomia* (?) *Archinacella* (?) *incerta*, the reviewer suspects belongs to a genus which would seem more at home in the horizon involved than either the Mesozoic pelecypod or the early Palæozoic gas-

[1] Preparation of scientffic articles, Science, p. 133, vol. 52, 1930.

teropod genus with which it has been tentatively coupled.

There are some errors in the numbers of pages and plate references. But the student interested in the faunas of the region dealt with should be thankful both to the author and the publisher, Professor G. D. Harris, for making available in convenient form 829 figures of the invertebrate and vertebrate fossils characteristic of the sediments which found a resting place along the New York-Pennsylvania boundary in late Devonian and early Carboniferous times. The plates are not so sharp and clear as those which usually appear in "Bulletins of American Palæontology", but this is doubtless because a large share of the figures are reproductions of illustrations from various sources. The author has supplied to go with these assembled figures either an abridgement of the original diagnosis or a citation of the original descriptions, which should make the work a very helpful manual for students working on the late Palæozoic faunas of Pennsylvania and New York.—E. M. Kindle.

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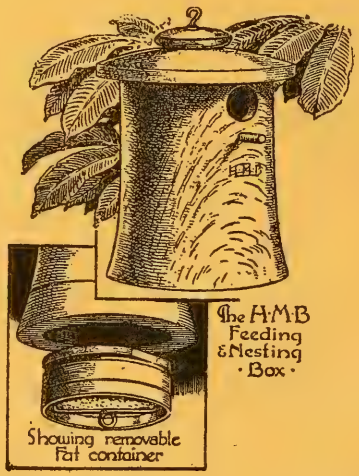

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